SEDGE-WARBLER FEEDING YOUNG CUCKOO.

Photograph by Cherry Kearton.

THE WAVERLEY
NATURE BOOK

A POPULAR DESCRIPTION BY PEN AND CAMERA OF THE DELIGHTS AND BEAUTIES OF THE OPEN AIR

VOLUME I

LONDON
THE WAVERLEY BOOK COMPANY LIMITED
96 FARRINGDON STREET, E.C.4

Printed in England by CASSELL & COMPANY, LTD.
1922

ALL RIGHTS RESERVED

CONTENTS

ANIMALS, HOW TO KNOW THE WILD. *By* DOUGLAS ENGLISH, B.A., F.R.P.S. *With Photographs by the Author.*

PAGE

THE MICE OF THE FIELD . . 3 | THE DORMOUSE 102
THE LONG-TAILED FIELD MOUSE . 51 | THE RED-BACKED MEADOW MOUSE . 132
THE HARVEST MOUSE . . . 84 | THE SHORT-TAILED MEADOW MOUSE 173

BIRDS, HOW TO KNOW THE. *By* THE REV. MAURICE C. H. BIRD, M.A., M.B.O.U. *With Photographs by* RICHARD *and* CHERRY KEARTON, C. REID, *and* J. T. NEWMAN.

A GENERAL SURVEY . . . 20 | THE WARBLERS 75
THE THRUSHES . . . . 59 | TITS, PIPITS, AND LARKS . . 110
THE FINCHES 145

CLOUDS, HOW TO KNOW THE. *By* WILLIAM J. S. LOCKYER, M.A., Ph.D., F.R.A.S. *With Photographs by the Author* 8, 65, 116

GARDEN, THE DELIGHTS OF THE. *By* H. H. THOMAS 37

INSECTS, HOW TO KNOW THE. *By* JOHN J. WARD *With Photographs by the Author.*

THE AWAKENING OF SPRING . 44 | SPRING'S TRANSFORMATION . . 69
THE COMING OF SUMMER . . 127

OLD ENGLISH GARDENS. *By* H. H. THOMAS 177

ON THE LOVE OF NATURE. *By* WALTER CRANE 1

RIVER, THE ROMANCE OF A. *By* J. LOMAS, F.G.S., A.R.C.S. . . 89, 159

ROSES AND ROSE GARDENS. *By* H. H. THOMAS 121

SEA-SHORE, THE LIFE OF THE. *By* F. MARTIN DUNCAN, F.R.P.S. *With Photographs by the Author.* THE SEAWEEDS 138

TREES GROWING IN BRITAIN, HOW TO KNOW THE. *By* HENRY IRVING. *With Photographs by the Author.*

THE BEECH AND THE OAK . . 28 | THE SWEET CHESTNUT . . . 107
THE BIRCH AND THE HORNBEAM . 153

WILD FLOWERS, HOW TO KNOW THE. *By* THE REV. H. PUREFOY FITZGERALD, F.L.S. *With Photographs by* HENRY IRVING. PAGE

THE FLOWERS OF THE WAYSIDE 15, 55 | THE FLOWERS OF THE WOODLANDS . 96
THE FLOWERS OF THE WATERSIDE . 167

LIST OF PLATES

SEDGE-WARBLER FEEDING YOUNG CUCKOO. *From a Photograph by* CHERRY KEARTON . . . . . *Frontispiece*

A KENTISH GARDEN. *From the Water-Colour Drawing by* MRS. ALLINGHAM, R.W.S. . . . . *Facing p.* 25

BLUEBELLS IN AN OAK WOOD. *From the Water-Colour Drawing by* MRS. RAWNSLEY 33

JUNE IN THE AUSTRIAN TYROL. *From the Painting by* J. MACWHIRTER, R.A., *in the National Gallery of British Art* 65

"THE GARDEN THAT I LOVE." *From the Water-Colour Drawing by* GEORGE S. ELGOOD, R.I. 89

SHAKESPEARE'S GARDEN, STRATFORD-ON-AVON. *From the Water-Colour Drawing by* A. C. WYATT 121

FOXGLOVES. *From the Water-Colour Drawing by* MRS. ALLINGHAM, R.W.S. . . 153

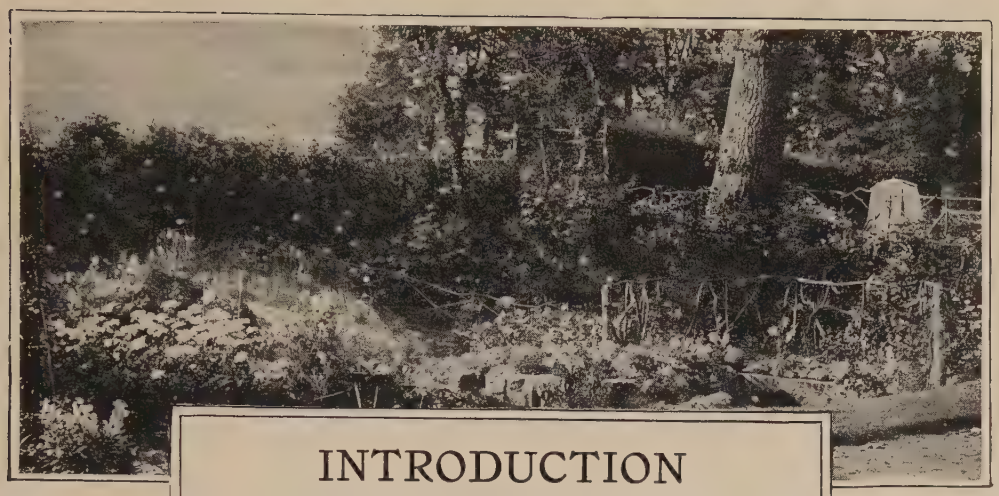
BLACKBOARD OUTLINES:—

PLANT LIFE—THE SEED—GERMINATION . . . . . *To face p.* 16

,, ,, —THE FRUIT . . . . . ,, 56

,, ,, —THE LEAF . . . . . ,, 96

,, ,, —THE FLOWER . . . . . ,, 168



INTRODUCTION

ON THE LOVE OF NATURE

By WALTER CRANE

THE tendency of modern civilised life seems, unhappily, to remove mankind more and more from close touch and sympathy with wild Nature. The town-dweller, for the most part, has to be content with such piecemeal substitutes for the green and open country as he may find in our public parks and gardens, and those rare green oases in the midst of our arid wastes of bricks and mortar, where it is still possible to see grass and flowers and leafy boughs, where the chirp of the dauntless London sparrow mingles with the softer note of the blue rock, which now almost competes with the ubiquitous bird of Venus, as the camp follower of man and the haunter of cities.

It is true there is an abundance of literature which makes constant appeals to the love of Nature, as well as to the desire of more knowledge of country life. Our newspapers frequently have articles to remind us of the changes of the seasons —over and above the daily weather report and forecast—recalling the quiet persistent life of the birds, and the never-ending wonder of their annual migrations. The writers, however, frequently appeal to the sporting instinct, which, perhaps, had at all times much to do with forming the habit of observation of Nature in man. For direct knowledge of the appearance of wild birds and animals in their natural habitat we are now more indebted to the patient photographic artist, with his frequently quite remarkable resources and ingenuity in obtaining his marvellous results.

Nothing, however, can quite compensate for the absence of those early impressions of a childhood passed in the country, when almost unconsciously a knowledge of the familiar trees, wild flowers, birds and animals and their habits, is acquired in the course of a life spent mostly out of doors in the woods and fields. Those who have such early memories seldom, I think, lose their love of Nature, and generally cherish a longing to return to the scenes of their youth. Even the town bred man may be at times conscious of a certain hunger for wild Nature, weary of the monotony of joyless, treeless streets, or touched by the pathetic response of struggling bulbs in glasses or

window boxes, as it were, reaching out for life with their tender green fingers, or when even the forlorn trees in dismal back yards respond to the touch of spring. Often, as the earth turns again towards the sun to renew her youth, some lingering instinct of our primitive arboreal ancestors awakens in us, and we feel with Keats that—

"To one who has been long in city pent,
'Tis very sweet to gaze into the fair
And open face of Heaven, to breathe a prayer
Full in the smile of the blue firmament."

It is pleasant to think that these yearnings are deeply planted in human nature, and that in cherishing them we are really gaining kinship with those interpreters of Nature, the poets and painters and naturalists. There is, however, not a little danger that long banishment from communion with Nature, especially amid the feverish rush and pressure of modern life, in many cases deadens the primitive feelings of sympathy with the natural life of the earth, as well as the powers of perception. The house of the mind accustomed to be filled with noisy guests shrinks from the silence and solitude by which man becomes intimate with Nature. Away from human voices and companionship, in the green quietude of the woods, or roofed but by the open sky on the moorlands, or on the shore by the breaking waves, many are oppressed by a sense of loneliness, although there is no loneliness like the loneliness felt in the midst of crowds of pre-occupied and unknown individuals hurrying to and fro in the streets of London. But, as Wordsworth says :—

"The world is too much with us, late and soon,
Getting and spending we lay waste our powers."

We do not give ourselves time to yield to the influences of Nature. Our ears have been deafened by the noise of city life, our minds filled with the dust and worry of trifles. Even the railway or the motor, which carry us away from men and towns, must be left behind before we can get back to Mother Earth and hear again the voices of trees and the birds, and enjoy the soothing green of the landscape, and become sensitive to that quiet sympathy of the earth which true lovers of Nature never fail to receive. In this clamorous age it becomes more and more important to preserve and to cultivate this love of Nature—this primitive sympathy and sense of oneness with the life and movement of the earth; and therefore the literature and the art which keep us in touch with Nature are of peculiar and priceless value, with all that informs us of her wonders, that presents to us the never-ending drama of the seasons, and the quiet persistent life of plants and animals, that unfolds to our minds the marvellous spectacle of constant evolution and transformation in the great unfathomable scheme of the universe.

WALTER CRANE.

HOW TO KNOW THE WILD ANIMALS

THE BROWN TYPE OF LONG-TAILED FIELD-MOUSE.

THE MICE OF THE FIELD—I

By DOUGLAS ENGLISH, B.A., F.R.P.S.

Author of "Wee Tim'rous Beasties," etc.

Illustrated from Photographs by the Author

"There is not one student, no, not one man in a thousand, who can feel the beauty of a system, or even take it clearly into his head; but nearly all men can understand, and most will be interested in, the facts which bear on daily life."

I PROPOSE, in writing these articles on the smaller British animals, to employ the names that are in general use, and to confine myself to the life-history and life-habits of my subjects, and only to touch incidentally on their structure. To the serious student a certain museum knowledge is essential—the more, indeed, the better; but it cannot be too clearly emphasised that in the case of the animals inhabiting these islands, nearly all of which may fairly be termed common in one part or another, it is the life-histories and life-habits that require working out. Their structure and their relationships have already been deeply investigated either in this country or abroad, and those who would become acquainted with the results of these investigations should consult the transactions of the learned societies.

If, however, we regard our animals as living, breathing, feeding, sentient beings, we find that singularly little is known about them, and that, as a natural consequence of this, singularly little is known of the adaptation of their structure to function and environment. In this direction the biologist is at a standstill for want of facts.

It must not be forgotten that the observation of animals' habits is extremely difficult—more difficult, for example, than the observation of the habits of birds and insects.

The difficulty arises from several causes. The majority of British animals are nocturnal—or at least twilight—animals, and pass the daytime sleeping (?) under cover. Most are of small size; indeed, with the exception of the deer, all British land animals *ferœ naturœ* may be described as small. I do not forget the otter, badger, and fox; but my own experience, and, I believe, the experience of most

people, is that the first sight of these creatures at large is disappointing. One's fancy had conceived them bigger. Bad drawing in the natural history illustrations

THE RED TYPE OF LONG-TAILED FIELD MOUSE.

is largely responsible for this disappointment, and, to some extent, over-stuffing in the museums.

Taxidermy has undoubtedly improved in recent years. There are certain subjects, however, notably mice and such small deer, which are, and always will be, beyond the taxidermist's art. Nor do I consider taxidermy at its best of much real value. A series of photographs and skins will provide most people with a better, because truer, conception of the living animal.

Apart from their nocturnal habits and small dimensions, the difficulty of studying the life-history of British animals is increased by the fact that their breeding quarters are, with few exceptions, completely hidden.

The Squirrel, Dormouse, and Harvest Mouse alone among our land animals construct their nests above ground level. The Marten may build (not adapt) a lofty nest for breeding (I know no record of it), but with this one possible, and three certain exceptions, no land animals' nest in this country is normally so situated that one can observe it through a telescope. Nor are animals' nests, when discovered, of the same convenient shape and obvious construction as those of most birds. They are spherical —not hemispherical; and, even in the case of the Harvest Mouse, there is small evidence of the material being interwoven designedly. Animal architecture is of a primitive kind. The animal collects a mass of material, dives into the middle of it, and by biting here and pulling there, and continually turning over and over, fashions a sphere around itself. All kinds of material are utilised: leaves, grasses, moss, wool, and such like; and one can usually distinguish the soft inner lining of the nest from its more substantial shell. I fancy that most Mice construct this lining by nibbling and splitting portions of the outer wall, but I have not been able to satisfy myself of this.

Each time the animal leaves its nest it makes a fresh exit, which closes by its own elasticity. This serves a double purpose where the young are concerned: it renders them invisible from without, and it keeps them warm by trapping some of their mother's heat. The difficulty of rearing a foundling hairless Mouse lies not so much in feeding it continually as in warming it continually.

Having discovered an animal's nest, one's natural impulse is to examine its contents. This impulse must be checked. However gently you disclose the babies, however gingerly you handle them, however neatly you replace them, the mother scents intrusion. She takes the first clear chance of moving. I have had this baffling experience with Hedgehogs, Moles, Shrew Mice, Dormice, and Meadow Mice. In the last case I witnessed the move. The youngsters were nipped by the scruff of the neck and dragged off one by one. This, I believe, is the usual method of transport, the choice between carrying and dragging being only limited by the size of the babies. There are records of it in connection with nearly all our animals, which are corroborated by the behaviour of one of my Field Mice in captivity—a shy, wild thing, who produced her litter within a few hours of capture. I took the young from her (there were five in all) very shortly after their birth, and handed them back singly. She took each

in her mouth in turn (her eyes were wonderful), and carried it back to the nest. A few hours later she had shifted family and nest from the south-west corner of the cage to its north-east corner. She had done her best.

It will be allowed, I think, that the difficulties of observing the growth of young Mice under absolutely natural conditions are extremely great, if not actually insuperable. Under artificial conditions something can be done, and the following notes on another Field Mouse family may perhaps be taken as typical of the early stages of Mice in general.

I have found the growth of infant Meadow Mice, Harvest Mice and Dormice in captivity to proceed on similar lines.

March 23rd, 1907. Five Long-tailed Field Mice born. The pair (this refers to the father and mother) sit on their family. Infants cling to mother when she jumps. Very small, pink, hairless, semi-transparent, blind, deaf.

March 28th, 1907. Young Field Mice now blue-grey above (the blue-grey of a dark, clean-shaven man), pink underneath, feet whitish, still partially transparent, hairless, blind, deaf.

March 31st, 1907. Brownish down, visible on head, neck, and shoulders. Ears flattened to the head, but showing the commencement of the conch. Fore-limbs large in proportion. Belly and legs naked. Blind, deaf. Blackish area sharply defined from pink flesh of muzzle, where bristles are sprouting. Tail longer, but very short compared with adult's.

April 1st, 1907. Brownish hair (yellowish brindle) everywhere except belly. Still blind and deaf.

April 3rd, 1907. Mice haired all over; still blind.

April 4th, 1907. Mice still blind, but fairly active on their legs. A strong demarcation between the sepia of the upper parts and the white of the lower. Took one from mother and placed at farther corner of the cage. It headed straight back. By scent?

April 7th, 1907. Mice opened eyes.

There are two interesting points in connection with these notes which are transcribed *verbatim*. The first is the length of time during which these young creatures remain blind, or at least with their eyelids tight-closed, and the second is the extremely rapid growth of hair when it has once started.

As a preliminary to considering our British Mice in detail, it will be best, I think, to deal with them shortly as a group, and to point out some simple external differences by which the various species can be distinguished.

The Mice belong to the vast family of gnawing animals (Rodents). It is a family which embraces perhaps a thousand species, but which, in point of individual size, would appear to have passed its prime. There are few, if any, existing rodents that would be a fair fighting match for their ancestors. The palæontologist tells us of a Giant Beaver; of a Megamys, a "master-great" Mouse as they would put it in Suffolk, nearly as large as an ox; of a Maltese Dormouse weightier than a Guinea-pig. It may be worth recalling that in the case of existing animals whose pedigree is traceable, decrease of size since prehistoric times is the exception rather than the rule. The Horse has sprung from a dwarf ancestor; so has the Rhinoceros; so has the Elephant. Huge forms existing in the past

THE HARVEST MOUSE.
The 3-pattern of white on the upper lip is characteristic.

AN OLD DORMOUSE.

seem to have found the world too small for them. The largest Whales are larger than any extinct animal known; but they, of course, have full space to turn in, and it would seem that for a land type to be persistent it must be modest in its claim for space. In their adaptability to tree, or ground, or river as a habitat; to fruit, or fur, or feather as a food; and in their modest dimensions, we have the secret of the permanence of Mice.

There are four good species of Mice on the mainland of Great Britain which may fairly be reckoned "Mice of the field"—the Long-tailed Field Mouse, the Harvest Mouse, the Short-tailed Meadow Mouse, and the Red-backed Meadow Mouse. Only one of these—the Long-tailed Field Mouse—is found in Ireland. The Orkney Islands possess a Meadow Mouse of their own, and several other islands round our coasts present, as might be expected, more or less "good" variations from the mainland type.

I propose to include the Dormouse under the same heading, as, although his position is not clearly defined, he is distinctly mouse-shaped, and he is considered nowadays to have more of Mouse than Squirrel in him.

These five Mice are easily distinguishable in the adult state. For a novice confronted with a strange Mouse, the simplest method of identification is to consider (1) the tail, (2) the head, (3) the colour.

In the case of the tail, it is the length compared with that of the head and body together that is most important. Taking the length of the head and body as unity, the tails of the five species work out on an average as follows:—

	Head and Body.	*Tail.*
Long-tailed Field Mouse	1	·95
Harvest Mouse	1	·8
Dormouse	1	·8
Red-backed Meadow Mouse	1	·4
Short-tailed Meadow Mouse	1	·25

There are distinct differences, moreover, in the structure.

That of the Long-tailed Field Mouse tapers gradually to the tip. The root-end and the greater part of its length is scantily haired, so that the "rings" are plainly visible. Towards the tip the hair grows somewhat thicker.

That of the Dormouse is stout and cylindrical and heavily haired throughout—bushy, in fact. The hair grows on it in a series of whorls, and its under surface presents, in a good light, a distinctly banded appearance.

That of the Harvest Mouse is haired throughout, and rather square in section. The under surface is distinctly flattened. The last quarter inch, the chief prehensile portion, is more fleshy and more flexible than the remainder.

That of the Red-backed Meadow Mouse is haired throughout, tapers but little, and

ends rather abruptly, though the long hairs at the tip are somewhat deceptive.

That of the Short-tailed Meadow Mouse is of similar structure, but can easily be distinguished by its shortness. It is often carried in a stiff down-curve.

Except in the case of the Dormouse, there is a sharp demarcation between the dark upper surface of these tails and the light under surface.

Taking the heads next, we find that the common House Mouse type is best represented in the Long-tailed Field Mouse, whose thinly-haired ears project boldly from the surrounding fur. In size of eye the Dormouse comes first, with the Long-tailed Field Mouse a good second. The eyes of the other three species are comparatively small, and, generally speaking, their heads and faces are superficially alike.

Colour alone is hardly a reliable guide, nor yet is size, unless one is certain that the Mouse examined is full grown. The colour of all Mice varies with their age, with their sex, with their surroundings, with the climate, and with the season of the year.

The under surface of the Long-tailed Field Mouse is often pure white, and that of the Harvest Mouse invariably so. In the case of the latter a tongue of white fur which stretches from the upper lip towards the eye is in itself sufficient to determine the Mouse's identity. There are traces of this marking in the other species, but in none of them is it so clearly defined.

There is considerable variation in the under surfaces of the two species of Meadow Mice. The Short-tailed Meadow Mouse is usually smoke-grey beneath, while the Red-backed Meadow Mouse inclines to cream colour.

The Dormouse has a white patch on the throat, but his stomach is a pale copy of his back, the transition from light reddish brown of the former (distinctly the lightest of the five Mice under consideration) being very gradually accomplished.

DOUGLAS ENGLISH.

THE DORMOUSE.

Landed after leaping upwards. The grasping character of the fingers and toes is noticeable. The "thumbs" are rudimentary, but their office is performed by the large pads adjoining them. The "great toes" are fairly well developed.

HOW TO KNOW THE CLOUDS

By WILLIAM J. S. LOCKYER, M.A., Ph.D., F.R.A.S.

Illustrated from Photographs taken by the Author

I

"Men judge by the complexion of the sky
The state and inclination of the day."
SHAKESPEARE (*Richard II.*, iii., 2).

THERE is no more interesting a branch of Nature Study than the observation of clouds, and the advantage of such a pursuit is that one has not to journey to any particular place, but can remain exactly where one happens to be, and view the masses of vapour in their varied colour and form as they pass majestically overhead.

From the earliest times man in all lands has interested himself in the appearance of the sky, and, after all, was not this most natural, considering that he was solely dependent on its aspect for any indication of prospects of fine or bad weather? In those days postal arrangements were slow or non-existent, telegraphs were unheard of, and meteorological offices or bureaus had not been formed. Man was dependent on his own observations and deductions, and the approach of cyclones and anticyclones, small and large swirls of air, which, as we now know, so dominate weather in many parts of the world, could only be foretold by him from the aspect and sequence of changes in the sky over his head.

The sailor, no less than the agriculturist, had to be a close observer of the sky, for he was obliged to take advantage of, and make the best use of, the opportunities of fair weather to take him to his destined port, for in those days his craft was frail and, comparatively speaking, a veritable pigmy. It was from such people that the interesting old weather-lore originated, and they put the results of their observations into rhyme to popularise them, and render them more easy to remember. A collection of these will be found in Mr. Richard Inward's excellent volume, entitled "Weather Lore."

It is important to remember that weather is very different in different parts of the world. The sky signs applicable in one region may forebode quite dissimilar weather conditions in a more distant country, as, for instance, Great Britain and India.

It is for this reason that the old weather prophet of one region was never considered of much value when he attempted to make forecasts in another and more remote district, and this indicates why in early days much more faith was placed in the man on the spot, the local man, who had lived there most of his life, than in any newcomer, however proficient he may have been in his own neighbourhood.

There is, however, no doubt that the close study of the forms and behaviour of clouds is one of great utilitarian value, and should play, if it does not already, an important part in the science of weather forecasting. One of the great advantages of cloud observations is that we are able to see for ourselves the actual movements of the air in the upper reaches of our atmosphere, at heights which, until quite recently, were not reached by any human apparatus. The employment of *ballon-sondes* and kites has now brought not only moderate but very great altitudes within reach of meteorological instruments; but even still we shall have to depend very much on clouds at these elevations, because

instruments cannot be permanently located there.

Further, clouds at high altitudes tell us something more than the actual direction of the air currents. Their formation and dissipation indicate to us some of their physical conditions as regards temperature, moisture, etc., which are of great importance in the study of the inner working of our atmosphere.

Besides the utilitarian there is the picturesque and poetic side to the observation of clouds. Who in a moment of idleness has not turned his eyes skyward and watched the varied shapes and colours of the vaporous travellers in the ocean of air wending their way towards the distant horizon? The reader has, perhaps, watched the hatching and growth of a storm, such as that so excellently described by Lucretius in the following lines :—

" Now clouds combine and spread o'er all the sky,
When little rugged parts ascend on high,
Which may be twined, though by a feeble tie;
These make small clouds, which driven on by wind,
To other like and little clouds are joined,
And these increase by more; at last they form
Thick, heavy clouds; and thence proceeds a storm."

"CLOUDS THAT ENVELOPED THE MOUNTAIN TOPS."
View from the top of the Esel, a peak of Mt. Pilatus.

Clouds have naturally fascinated the minds of many painters, but how few of these have been able to portray faithfully the majestic nature and unquestionable beauty displayed by their subject. The painter is undoubtedly handicapped by their fleeting nature, and he can only put on his canvas an impression made up from his recollection of the scene, assisted by notes written down at the time.

The photographer is perhaps in a worse plight, for although he can secure instantaneously a faithful record of the cloudscape before him, the resulting picture lacks life, because it is devoid of the

most important feature of the scene—namely, colour.

The day, however, is not far distant when, owing to the researches of a long list of ardent workers, true colour photography will be an accomplished fact. Then, and then only, shall we be able to depict faithfully and instantaneously both the forms and colours of the sky and clouds. Each of us will be able to secure and cherish our own gems in the nature of brilliant red sunsets or golden dawn effects.

To return, however, to the utilitarian side of the subject, it is proposed here to consider only the question of the appearances of the different kinds of clouds, and so help the reader that he may be able to recognise and correctly name them himself, preparatory to comparing their appearance with the actual or subsequent weather conditions experienced.

Perhaps it is hardly necessary to state that numerous classifications of cloud forms have been suggested from time to time by those who have gone deeply into the subject. As far back as the year 1803, Luke Howard was one of the first who brought out a system of nomenclature —and this was so good that it held first place up to quite recent years. Many other attempts at a more scientific classification have also since that date been made, but the majority of them, with perhaps the exception of that of Clement Ley, were simply makeshifts.

The reader will quite understand how important it is to have *one* classification, because, with many current, the same type of cloud could be, and was, called by several different names. It was hopeless, then, to discuss from a scientific point of view the observations of several workers, since the nomenclature in many cases was so different.

The question was, however, settled by the International Meteorological Committee, which specially appointed a subcommittee to report on the various classifications in use, and to devise a more simple and efficient system. The result of this step was that an international system of cloud nomenclature was agreed to by the heads of all the meteorological institutions throughout the world. Not only this, but an international cloud atlas, with text in English, French, and German, was soon published, and is now in general use wherever scientific observations of clouds are made.

Before stating the details of this classification, it is as well to become familiar with three conspicuous forms of cloud-structure which are quite distinct in appearance. Perhaps the most common form of them all is that which has a heaped-up appearance, lumpy, in fact, with the under surface more or less horizontal. This form of cloud is sometimes very striking by reason of the great thickness in its vertical direction, and it occasionally puts on the appearance of an enormous cauliflower. This form of cloud is termed *cumulus*.

In great contrast to this, we have a form of cloud which arranges itself in long, horizontal sheets or layers. In this case the vertical height is insignificant compared to its great extension in the horizontal direction. The name given to this shape is *stratus*.

The third and last prominent form is that which presents a hairy or fibrous appearance. It is usually very delicate in structure, and sometimes takes the form of feathers stretching across the sky, occurs only at high altitudes, and is known as *cirrus*.

When the reader has well mastered these three main varieties of cloud, he has a firm basis on which to class the other manifold characters which the clouds at times assume, since they are all simply stages of gradation between those types.

It must not be forgotten, however, that clouds are formed at nearly all altitudes. Sometimes they are actually on the ground, when they are called mists or fogs. Sometimes, again, in mountainous districts they are seen to enwrap for a time the mountain peaks. We observe such clouds in the illustration on page 9, which, as they passed the mountain top from which this view was taken, enveloped it in a thick mist for the time being. The mountain in question was the Esel, one of the peaks of Mount Pilatus, near Lucerne. This peak rises 6,962 feet above sea level, and the small bundles of cloud visible near the middle of the picture are just about to obliterate the view of the town of Lucerne,

which can just be seen in the distance above their tops.

At other times clouds attain such tremendous heights that it seems almost impossible to form an estimate of their elevation. The upper clouds are a most important factor in the science of weather forecasting, and their use for this purpose has been noticed from very early times, and handed down to us in one of many of the old sayings, "the higher the clouds, the finer the weather."

By means of careful measurements with appropriate instruments, the heights of various types of clouds have been accurately determined. On the basis of these data three layers, so to speak, have been adopted—namely, the upper, the intermediate, and the lower layer. The average height of the upper layer is taken as about 9,000 metres, or about 30,000 feet. The intermediate extends from about 3,000 to 7,000 metres, or it may be said to have a mean height of 5,000 metres, or about 16,000 feet. The lower layer has a height of 2,000 metres, or 6,500 feet.

In cloud classification, the nomenclature is so adopted that in addition to the form of the cloud the height is always included. This procedure is found most useful, because the same form of cloud frequently occurs at different levels.

Broadly speaking, it may be said that clouds in the upper layer may be identified by the prefix *cirro* to their type, and those in the intermediate layer by the prefix *alto*. In the lower layer no prefix is necessary, but the clouds assume their single names—*i.e.*, *cumulus* and *stratus*. The above, however, is not strictly true, but may be taken as a second step towards mastering the adopted international scheme, which is as follows :—

A.—*Upper Clouds* (average height 9,000 metres).
- *a* 1. Cirrus.
- *b* 2. Cirro-stratus.

B.—*Intermediate Clouds* (between 3,000 and 7,000 metres).
- *a* 3. Cirro-cumulus.
- *a* 4. Alto-cumulus.
- *b* 5. Alto-stratus.

C.—*Lower Clouds* (2,000 metres).
- *a* 6. Strato-cumulus.
- *b* 7. Nimbus.

D.—*Clouds of Diurnal Ascending Currents.*
- 8. Cumulus.
- 9. Cumulo-nimbus.

E.—*High Fogs.*
- 10. Stratus.

If this classification be carefully examined it will be noticed that the words *cumulus* and *stratus* are used to define the form that clouds assume at even high elevations. Thus, for instance, if one observes *cirrus* cloud—that is, cloud say five miles high—and it appears in the form of sheets, it is termed *cirro-stratus ;* while if it takes the form of small, lumpy masses, as in the case of mackerel sky, it is called *cirro-cumulus*. *Cirro-cumulus* does not, however, occur at quite so great an elevation as the *cirro-stratus*, and so is classed at the head of the intermediate layer, as will be seen from the foregoing classification.

Two other points in the classification require, perhaps, further explanation. The first is the term *nimbus*. This name simply implies a *cumulus* cloud from which rain or snow is falling, and is generally a very thick, dark cloud. The second point refers to the small letters *a* and *b* before the cloud names. The former means that the clouds are in separate or globular masses, which is generally the case in dry weather ; while *b* indicates that the forms are widely extended or completely cover the sky, as in wet weather.

Let us now take each of the types of clouds in turn and, where available, illustrate them by photographs, so that a typical picture may be retained for purposes of reference. It must, however, be borne in mind that the varieties of cloud forms are really innumerable, and that no two pictures of the same kind are alike, for, as already pointed out, there are all stages of change from one type to the next.

To begin with, let us start with the high or upper clouds, which consist of the *cirrus* and *cirro-stratus* types.

Cirrus clouds are of a fibrous or feathery nature, and sometimes these feathers stretch right across the sky, apparently converging towards the horizon as a result of perspective. The illustration on this page is a good typical example of such clouds. In this picture the observer is looking due west, and the sun is well down towards the horizon. The photograph was taken on October 23rd, 1906, at 4.30 p.m., at South Kensington, and the towers seen are a portion of the Natural History Museum. From the lie of the clouds it will be noticed that the direction of the wind in this elevated region can be estimated.

CIRRUS CLOUDS.
Photographed at South Kensington at 4.30 on an October afternoon.

Sometimes cross currents invade these regions, and the thin, fibrous-like clouds are drawn out into fantastic shapes. The photograph at the bottom of page 13 illustrates such a case, and is from a photograph taken from the same spot, only looking southward, on September 24th, 1906, at 3.45 p.m. Here we see

CIRRO-STRATUS CLOUDS.
This type appears here as radiating from the horizon. The small, white, fluffy clouds are cirro-cumulus. Photographed at South Kensington on a June afternoon.

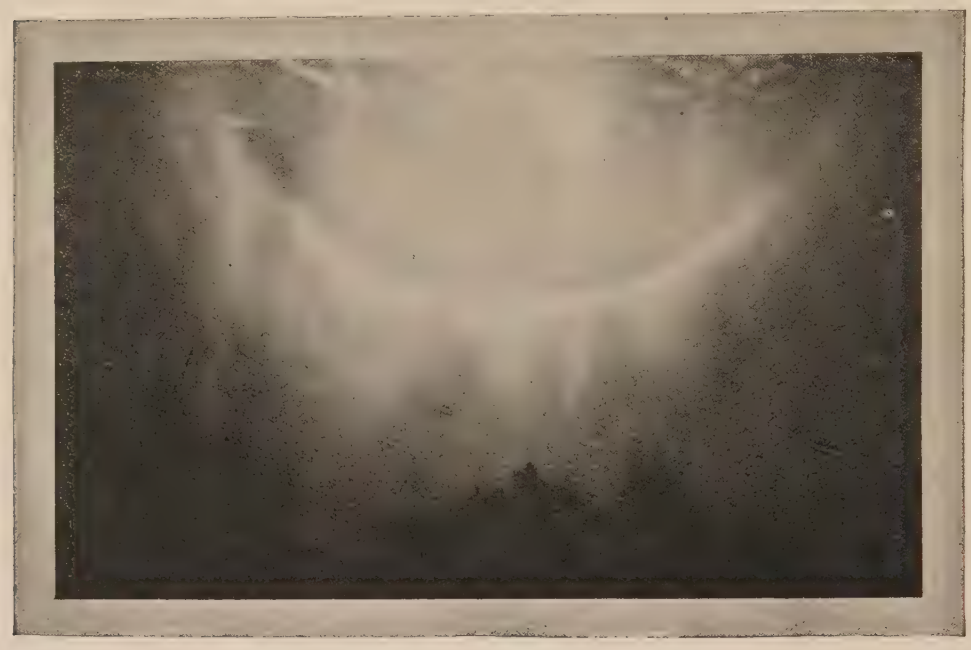
CIRRUS CLOUDS.
The fantastic shapes are due to different air currents. Photographed at South Kensington on a September afternoon.

the filaments twisted and twirled about as if the sky had been smeared here and there.

It was evidently such a scene as this that is referred to in the old weather-lore saying :

"Trace in the sky the painter's brush,
The winds around you soon will rush."

and in order to screen the lens from the sun, which was right in front of the camera, a shade was held over the objective. Although the greater and more distinct portion of the cloud in the picture is alto-cumulus, the cirro-stratus will be observed in streaks radiating from the horizon-like spokes from the hub of



CIRRO-STRATUS CLOUD FORMING A SOLAR HALO.

This photograph was taken in the same direction but a few minutes after that reproduced at the top of p. 13.

At these altitudes we find also the cirro-stratus clouds. This consists, as a rule, of a thin, whitish layer, which at times covers the whole sky and makes the sky appear whitish instead of blue. Such a cloud is responsible for the beautiful halos—sometimes single, sometimes double—which are seen at times encircling the sun with radii of different lengths.

Such a cloud does not lend itself at all to photography. At times, however, it is not homogeneous, but presents the appearance of straight streaks, which converge towards the horizon or a tangled web. It is then that the camera can be used with effect, as the photograph at the top of p. 13 will show. This was secured on June 23rd, 1907, at 1.23 p.m., at South Kensington. The camera was pointed in the direction of south-west, a wheel. As the wind, which was strong at the time, was south-west, both types of cloud gradually passed overhead. Eventually the alto-cumulus passed nearly out of the field of the camera, as can be seen from the illustration on this page, while the cirro-stratus was still blowing up. The latter was the cause of a most brilliant halo, which is depicted in this illustration, the camera not having been moved between the two exposures. The streaky appearance of this halo is due to the stripy nature of the cirro-stratus. The position of the sun can easily be determined by finding the centre of the circle which forms the halo.

It seems to have been generally conceded that solar halos indicated the advent of wet weather, for one old saying runs as follows :

"The circle of the moon never filled a pond;
The circle of the sun wets a shepherd."

While another states:

"The bigger the ring, the nearer the wet."

Whether this is borne out by modern statistics I am not prepared to say, but the only two halos I have photographed were followed by fine weather the next day.

WILLIAM J. S. LOCKYER.

HOW TO KNOW THE WILD FLOWERS

By the REV. H. PUREFOY FITZGERALD, F.L.S.

Illustrated with Photographs by HENRY IRVING

THE FLOWERS OF THE WAYSIDE—I

WITH the supposition that everyone (and I imagine there can be very few exceptions) who takes a ramble in the country, likes to know the names of the common flowers he is likely to meet with and to understand a little about their life-histories, their romances, and their strivings in the great battle for existence, the intention of these chapters is to serve as an introduction. It has been said that "a little learning is a dangerous thing," and in some instances, undoubtedly, this is true; but often the reverse is the case, and a little knowledge of common wayside objects, flowers, birds, insects, or whatever they may be, does add to the interest of life to a surprising extent. At any rate, a country walk need never be dull. There is always something to attract the attention; to divert one's thoughts into other paths, for even the smallest and most insignificant object in creation is capable of imparting a store of knowledge, if only the eyes are open to see and the heart ready to receive.

Be it understood, then, that the study of botany is not the intention. Botany—that science which, to the beginner, would appear to be a store of difficult and incomprehensible terms, which have set a great many against it, and often made the would-be lover of flowers hate the very sight of them. It is not given to all to wish to be botanists, but there is implanted in everyone a love of Nature, and especially a love of the flowers which brighten to such a degree the face of the earth. Most people like to gather them and to have them near for the sake of their cheerful company and pleasing scents; at the same time, it is somewhat dull to be surrounded by companions whose very names are unknown, and to be ignorant of any small points of interest connected with them; not to understand why one flower is formed in this shape and another in that; why one plant grows tall and another lies flat on the ground; and some of the various ways in which Nature, after many hundreds of years' experience, has adapted each one so that it may the more surely reproduce its own species. A great deal of this can be readily understood with a little knowledge, and so much interest may be awakened that it may prove to be but an incentive to understand more about the hidden mysteries of the world.

Under separate headings, then, the more common flowers of the wayside, woodlands, hedgerows, corn-land, and so on, will be here dealt with in turn. The photographs will, so far as is possible, show the plants growing in their natural haunts; and these, it is hoped, will enable the rambler in his walks to identify the flower, by showing the mode of growth, the form of the blossom, the shape of the leaf, and the general appearance. The descriptions are not intended to form a botanical guide; if this

LESSER CELANDINE.

special knowledge is required, it must be sought for in one of the many handbooks to the British flora. Their object is to point out any special feature which may assist in the identification, and to set before the reader any facts of interest which may be seen in the growing plant or which pertain to it, such as the explanation of a peculiarly shaped flower or leaf, the origin of its name and so on.

One of the most fascinating studies in plant life is that of fertilisation. Each blossom appears to have been gradually brought into its special shape with a view of securing, in the best manner possible, the transference of the yellow dust (the pollen) from the male portions, the stamens, to the female organ, the pistil. But Nature abhors self-fertilisation—that is, the act of fertilising a flower with its own pollen; many and varied are the means by which this is either wholly or partly prevented. Insects of all kinds are called in to assist, special precautions being often taken to keep out unwelcome guests; whilst the colours, scents, and the store of honey all serve as attractions. The brightly coloured flowers are visited by day-flying insects, bees being among the most welcome; while the night-blooming plants are generally white and very fragrant, whereby moths are attracted to them.

Again, there are many different ways by which a plant is able to disperse its seed; in some cases, as in the Dandelion, a light, feathery pappus or down is attached to each seed, so that the wind will catch it and blow it away until it at last finds a rest in what may be a favourable spot for germination. In other cases some mechanical explosive device is adopted, the walls of the seed vessel, as it ripens, being drawn together under great tension, and then, when the state of the atmosphere is most favourable, the explosion suddenly takes place, and the seeds are shot out in all directions.

Features of this sort will be mentioned and briefly explained, in the hope that the reader will turn his attention to these little details and verify them for himself. To all those who will try to unravel the secrets of the plants, I can promise the gradual unfolding of a wonderful world; mysteries, hidden to the uninitiated, will

PLANT LIFE

THE SEED

Specimens required :—Seeds of Broad Bean, Pea, Scarlet Runner Bean, etc.

Structure

Obtain specimens of large seeds—*e.g.* Broad Bean. Soak these in water and examine them after two days. Note the swollen condition of seed due to absorption of water. Distinguish the stem scar (hilum). Squeeze the seed between the fingers, and note that water is discharged through the micropyle. Remove the seed coat (testa) and note the two seed lobes and embryo root (radicle) and stem (plumule). Similarly examine seeds of Pea. Make drawings indicating the structure of seeds examined.

Germination

Sow several kinds of seeds—a few in the garden plot and others in sand, fine soil, or moistened sawdust. Note the swelling of seed and growth of radicle and plumule.

Note by measurement the amount of growth made by both radicle and plumule. Observe the mode of growth of the plumule. The seed leaves appear (note the function of these). Finally the foliage leaves are seen.

Record observations by making sketches of seedlings in various stages of growth. Determine the period of germination, noting carefully the conditions under which germination takes place.

Conditions of Germination

Take several seeds and divide them into three groups. Place—

1st group in ice,
2nd group in dried sand,
3rd group in soil, and place in darkness.

Note results and determine conditions necessary to germination—air, warmth, moisture, light. Observe that, although seeds will grow in darkness, light is essential to healthy growth.

The Seed - Germination.

Type - Broad Bean

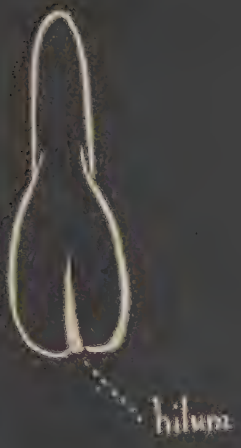
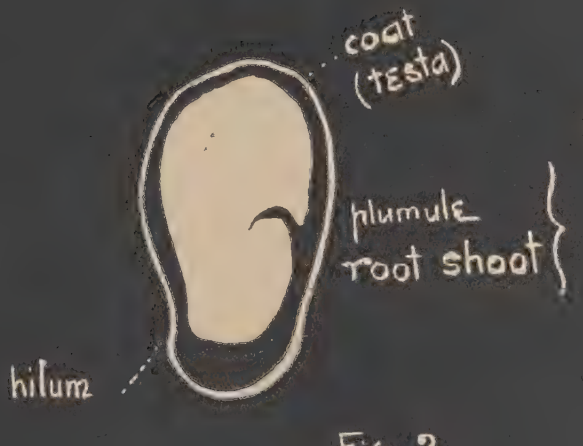


Fig. 1



Section of seed.

Fig. 2.

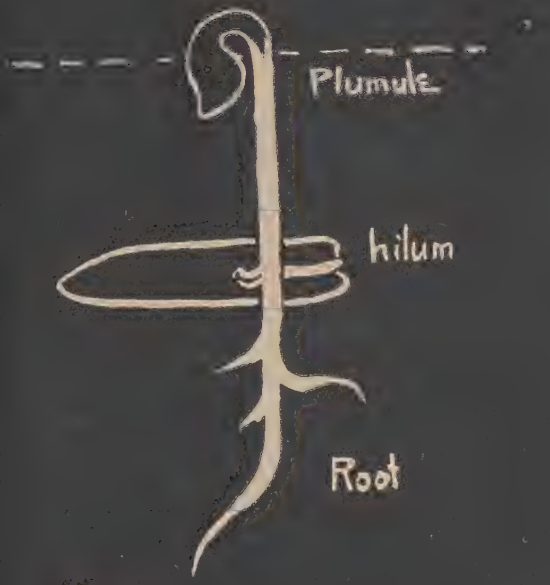


Fig 3

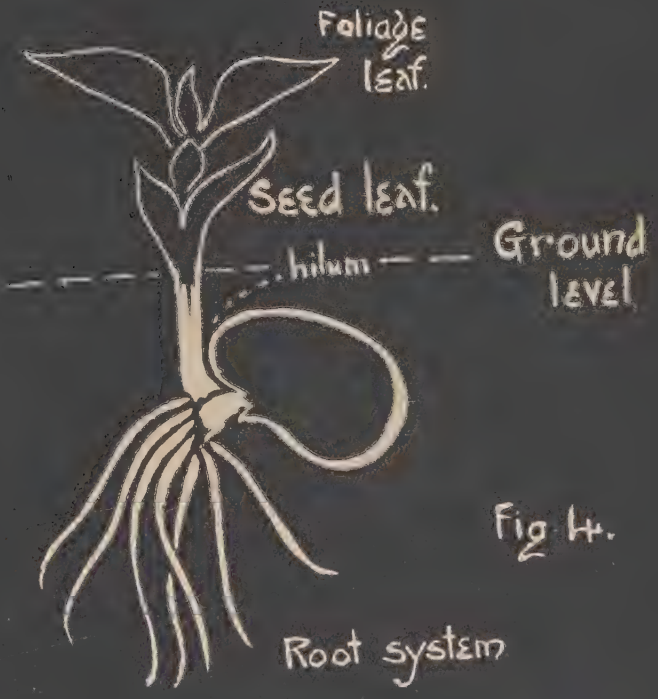


Fig 4.

Sketches illustrating parts of seed and stages of germination

begin to reveal themselves, and the whole of the countryside will be found to be teeming with interest.

THE LESSER CELANDINE

One of the earliest of plants to unfold its bright blossoms and to remind us of the coming of springtime is the Lesser Celandine, covering the ground beneath the hedges, with its dark green, shiny heart-shaped leaves and its bright yellow flowers. Its name, *Ranunculus ficaria*, tells us that it is a very near relation to the Buttercups; the Latin *rana*, a frog, gives rise to the first name, since this plant delights in the damp situations which frogs are also fond of frequenting; the specific name, *ficaria*, comes from *ficus*, a fig, and if you will dig up a plant, you will see that the roots consist of several little tubers, somewhat resembling figs in shape. Examine several of the flowers, and you will find that each one possesses three sepals, the small green leaf-like appendages at the back; but the number of shining yellow petals varies from six to ten, or even more. There are also numerous stamens, surrounding the central portion of the flower, which consists of several carpels arranged in a globular head, each of which contains the embryo of a future seed. The head of each stamen is enlarged, and forms what is botanically termed the anther; inside this the yellow fertilising dust, or pollen, is produced, and presently liberated, some of which must eventually find its way to the sensitive stigma at the top of each carpel before any seed can be borne; here it will be induced to send out tubes to the young embryo seed, down which will flow the fertilising fluid.

The Lesser Celandine must not be confused with the Greater Celandine, a plant which grows in the hedges and flowers about May, and which is, in reality, a kind of Poppy. These two can be easily distinguished, as the latter has four yellow petals only and much bigger leaves, and it does not flower until later in the year.

SILVERWEED

One of the most common plants to be found by the roadside is the Silverweed

SILVERWEED.

(*Potentilla anserina*), which, by the beauty of its silvery leaves and large flowers, is sure to attract the attention of the passer-by. The leaf, as the photograph shows, is of a feathery, or pinnate, form, and it is closely covered with a silky, white down, especially underneath, whilst each

fancy that geese are fond of grubbing it up and eating the roots. Other common names are Goose Potentil and Prince's Feather.

BARREN STRAWBERRY

The Barren Strawberry is another of the same family, its botanical name being

BARREN STRAWBERRY

large, yellow blossom is borne on a somewhat long stalk. The plant spreads rapidly by means of creeping runners, much in the same way that the Strawberry does, and may be seen in flower during May, June, and July. To be seen at its best, it should be looked for in damp, poor pasturages; those found by the dusty roadsides generally are not so well developed. The flower will be found to have five yellow petals, and twice as many green sepals behind. The name *Potentilla* is derived from the Latin *potens*, powerful, as some of the family were formerly supposed to have strong medicinal properties; *anserina* comes from *anser*, a goose. Exactly why it was so called I cannot say for certain, but I

Potentilla Fragariastrum. You must be careful to distinguish this from the Wild Strawberry (*Fragaria vesca*), for which it is very often mistaken, since the general habits and the leaves and flowers of both plants resemble each other very closely. In the Barren Strawberry the petals are generally somewhat shorter than the divisions of the calyx (the sepals), and the whole blossom is smaller than that of the Wild Strawberry; but the principal and most noticeable difference lies in the fruit—in the former, this does not swell or become succulent, but is always hard and hairy, and as the fruit and flower are very often to be found on the same plant, it is easy to distinguish it. The Barren Strawberry begins to flower about March, and

goes on till May or June, while the Wild Strawberry is seldom found blossoming before May, and continues more or less throughout the summer.

THE GREATER STITCHWORT.

Towards the end of April, the Greater Stitchwort, or Starwort (*Stellaria Holostea*) begins to put forth its white, starry blossoms. This plant is one of the Pink family (*Caryophyllaceæ*), the members of which are herbs having round, jointed stems, with a thickening at the junctions, called nodes; the leaves are arranged in pairs, situated opposite each other, with smooth edges. If you look carefully into a Stitchwort blossom, you will see that there are five green sepals, five deeply divided white petals, ten stamens, and three styles. (A style is the stem of the pistil, the female portion of the flower; at the base of the style is the ovary.) Some of the members of the Pink family have their different parts arranged in fours, instead of in fives; but in all of them the petals possess a broad blade, while the lower portion is narrowed down to what is termed a "claw." In the Stellaria five of the stamens become elongated soon after the flower opens, and incline towards the centre, so as to be well in the way of the body of any insect flying on to it in search of honey; these wither, and then the second set of five stamens mature. In the third stage the pistils rise and expand their sticky, sensitive surfaces (called the stigma), and they do this in time to rub against the latest matured stamens, so that in case no insect visits and fertilises the flower by bringing the pollen from another plant to the stigmas, self-fertilisation takes place; these different stages can readily be found, and may often be seen on the same plant. The old herbalist, Gerarde, says that this plant was called Stitchwort, because a decoction of it was used to cure a stitch in the side.

GREATER STITCHWORT.

H. Purefoy FitzGerald.

HOW TO KNOW THE BIRDS

By the REV. MAURICE C. H. BIRD, M.A., M.B.O.U.

Illustrated with Photographs by
RICHARD AND CHERRY KEARTON

I.—A GENERAL SURVEY

YOUNG RED-BACKED SHRIKE.

IT is a remarkable fact that even the inhabitants of our country villages, every one of whom probably has done more or less birds'-nesting in their youth, are nevertheless unable to mention by name—much less to identify by sight—a round score out of the 400 and more birds that are enrolled upon the British list. Some may know "a Hawk from a Harnser," (Heron), but, as a general rule, if all their Geese are not Swans, all their Martins are Swallows, and all their Rooks are Crows, and that without any intentional reference to scientific accuracy.

It is only within recent years that any active intelligent interest has been taken by the general public in any branch of natural history. Now, thanks greatly to the Nature Study movement having been introduced into our schools, the rising generation is being encouraged to use and improve its powers of observation, to the exploding of many a former popular fallacy.

But although it is now well known that the Cuckoo does not turn into a Hawk in winter, and that many birds, which once, in different phases of plumage, were supposed to belong to distinct species, are mere sexual or seasonal variations of one and the same species, still, each succeeding year, nearly, adds a new name to the catalogue of our occasional feathered visitors, so that it becomes increasingly difficult to identify with certainty the birds of our rambles. Who has not been puzzled by verbal descriptions of birds? A friend, full of excitement, comes and tells you that he has seen a bird, the like of which he is quite sure that he has never seen before, and in his eagerness to describe it to you exactly, he paints a lengthy word-picture, suggestive of an ornithological rarity. He gives you details of size and shape and colour, which in one or other particular might be applicable to several species. You give your informant credit for some knowledge of all the commoner forms of local bird life, and cast about in your mind's eye for the most likely casual visitor to fit in with the most salient points of his picturesque description, and finally are obliged to arrive at the conclusion—much to his disappointment certainly, and your own too, perhaps—that he has, after all, merely come across a veritable commoner, but at an unusual season of the year, or in an unexpected locality—a Reed Bunting in a stackyard, or a Jack Snipe in July.

Even with a bird in the hand, specific, sexual, seasonal, and age-distinguishing marks are often both small to behold, and difficult to describe, without a knowledge and use of scientific terms. At a distance, the difficulty of identification is, of course, far greater, especially when the observer is ignorant of what characteristic feature or flight, note or attitude, to look out for. Nor is it easy to lay down any hard and fast rules by which to aid the tyro outdoor student of British birds

to recognise, at sight, the various flitting forms of feathered life, which one may

SWALLOWS ON A TELEGRAPH WIRE.

chance to meet by land or water throughout the year.

It is impossible to draw a strict line of demarcation between birds of the sea, sky, or trees, or those frequenting sand, mud, or rocky shore. If we attempt to classify, either by approximate size, general coloration, formation, or manner of flight alone, inevitable confusion awaits us; and even if we heard the note of every bird we saw, and could copy it sufficiently well to satisfy ourselves, we should be met with the difficulty that all people do not hear exactly alike, and therefore we might not be able to convey to another the information that we desired. There are, of course, many birds which, once identified, could not possibly, in note or appearance, be again mistaken; but on the other hand, there are also many which so closely resemble one another, that very careful and minute examination is absolutely necessary before we can determine the species, whilst in others the dissecting knife alone can declare the sex.

The following remarks, then, by no means pretend to form a precise and all-sufficient guide to the identification of birds, but are intended only to afford some hints and suggestions which may prove useful in assisting to name the commoner birds of our country. It will be as well in the first place to say a few words about those bodily parts which all birds possess in common, and to remember that "use increases, and disuse decreases parts," from which we may infer that the special development or modification of the legs or wings, feet or beak, of any given bird will tell us something of its life-history, habits, and habitat, and thus help us towards its identification.

Thus those birds which spend most of their time in the air, and procure their food whilst flying, will be found to possess highly developed wings. Of such birds the Swallow tribe afford a striking example. Those which seldom fly, and procure their food from the ground, require feet well fitted for rapid running; hence we find the hind toe either entirely absent or quite rudimentary in such rasorial birds as Bustards and Partridges. Swimming birds, again, will be found to possess keel-shaped bodies, close, waterproof feathering, and feet adapted for paddling, webbed in the Ducks, lobated in the Grebes. Birds which wade in water for a living have long, bare legs, and comparatively elongated necks and beaks—the Curlew and Snipe, for instance. Those which prey upon others require not only great wing power, but also claws to hold and beaks to rend; hence we find that the Hawk tribe have not only the proverbial eagle-eye, but

TYPES OF SWIMMERS: MALLARD AND WILD DUCKS ON ICE

are also highly specialised in tooth and talon; whilst their cousins of the night have acquired soft feathers for noiseless flight and powers of vision adapted to their twilight wanderings. Birds which dwell much in trees and nightly rest thereon have the hind toe and claw well developed, in order that they may securely grasp the swaying branches. Diving birds, from habits long indulged, have modified their wings to such an extent that they now serve as useful fins; whilst the tail, which would be an impediment to submerged flight, has practically aborted, as may be well seen in the Grebes. Woodpeckers, using their caudal appendage as a prop or stay whilst prospecting perpendicular tree trunks for food, have, after long ages of such action, greatly strengthened this point of resistance.

GREEN WOODPECKER.

The old Linnean system of classification, in which birds of prey head the list—divided into day and night feeders—forms, I think, the easiest form of first aid both in nomenclature and identification of species. We will therefore just run through the six great families, and then proceed to some more original sortation remarks, such as descriptions of peculiarities of shape and make, note or habit, which may assist the tyro naturalist in answering the oft-asked question, "What bird was that which I saw just now by sea marge or river side, in hedge or field or wood, or marsh or garden-grass plat?"

The Eagle is generally looked upon as the King of Birds, and the order to which it belongs ranks first in the Linnean classification to which I have referred; but, with the exception of a chance sight of a Golden Eagle in the north of Scotland, no real Eagles are likely to be met with by my readers.

All the Hawk tribe are Eagles in miniature, and two species of Hawks are more or less common in every English county—the Kestrel and the Sparrow Hawk, the former being the most frequent. How, then, may we be able to distinguish the one from the other? Chiefly from their distinctive habits.

Generally speaking, all other birds are more or less afraid of birds of prey—Eagles, Hawks, and Owls; and our attention is very likely to be first attracted to the presence of any one of them by the noisy and alarmed behaviour of what small birds there may happen to be in the vicinity. If the Hawk be a Kestrel, it may soon be identified by its peculiar though beautifully distinctive habit of hovering over open ground in its search for field mice and voles, which form its staple diet. The keen eye of a Hawk is proverbial, and rightly so, for it is so wonderfully contrived as to be equally useful for near and far sight. When, then, the hovering Kestrel (about twice the size of a Thrush), poised on motionless or rapidly pulsating wings and expanded tail, has located a mouse in the herbage below, it noiselessly drops like a bolt from the blue, clutches the prey in its talons, and either proceeds to devour it on the spot or carries it away in its talons.

In early spring the loud and penetrating call-note, or rather ringing cry, "Kli-kli-kli," frequently betrays the presence of the "Windhover"; and when once this note has been identified it cannot well be mistaken for that of any other bird. Ivy-clad ruins, church towers, dilapidated windmills and tall trees—especially in the neighbourhood of a

rookery—are the generally chosen nesting site, and although at other seasons of the year all members of the Crow family will usually mob a Hawk of any species, both Kestrel and Sparrow Hawk are allowed to nest near by a colony of Rooks in peace. In flight, all the Hawk tribe appear to possess very short necks, long wings, and tail.

The Sparrow Hawk is not so frequently seen as the Kestrel, not merely because it is not so common, but also because it does not procure its food by such comparatively slow and conspicuous methods as those adopted by the sky-scraping Kestrel. Hunting hedgerows and coppices, it boldly and suddenly makes a dash at any bird that comes in its way; nor does it hesitate to attack those larger than itself.

In all Hawks the female is larger than the male, and

SPARROW HAWK AND YOUNG.

this difference is especially noticeable in the Sparrow Hawk, the female being sometimes as much as three inches longer than her mate. The Sparrow Hawk's tail is longer in proportion to the wings than is the case with the Kestrel. If a close enough view be obtained it may be noticed that the upper surface of the body is of a light chestnut colour, whilst that of the Sparrow Hawk is a dull brown; the breast of the former is spotted and that of the latter delicately barred.

MERLIN SITTING ON NEST.

The Merlin, sometimes to be met with as an autumnal migrant, accompanying an influx of Larks, may be described as a miniature Kestrel in shape and make; whilst the Hobby is like a small Sparrow Hawk, and sometimes appears with the Swallows in spring. Game protection, however, has made it rare in England, it being the boldest as well as the smallest of our raptorial birds. Together with the far larger and equally scarce Peregrine Falcon, it has a conspicuous patch of black feathers, like a short and thick moustache, at each corner of the gape.

HEAD OF PEREGRINE FALCON.

Should you happen to reside near a rocky coast and notice a large Hawk attacking the cliff-haunting seabirds, or in a marsh or moorland district and discover consternation amongst the Peewits or Wildfowl, or in a well-wooded country and find traces of havoc committed among the Pigeons, the culprit will most likely prove to be a Peregrine.

YOUNG PEREGRINE FALCONS.

The other less common large Hawks, such as Buzzards and Harriers, generally confine their attentions to small mammals, young or wounded birds, birds' eggs, and even large insects. The Honey Buzzard obtains its name from its fondness for wasp grubs, a habit which sometimes brings a stray specimen under the observation of the roadside naturalist. It is the only British Hawk which has no patch of skin bare of feathers between the eyes and beak—a provision of nature, perhaps, to protect the nostrils from the stings of the parent wasps.

A KENTISH GARDEN.
From the Water-Colour Drawing by Mrs. Allingham, R.W.S.

The Osprey, or Fish Hawk, is so rare that we need only refer to its distinguishing features—namely, pale blue legs, feet, and cere, which in other species of Hawk are of various shades of yellow. Its outer toe is reversible, the legs are comparatively short, and the feet are prickly underneath, to assist its long and much-curved claws in holding its slippery prey; the scalp feathers are slightly elongated, and give the bird when at rest the appearance of having put on its cap with the peak pointing backwards.

A PAIR OF OSPREYS AND THEIR NEST

The connecting link between day- and night-feeding raptorial birds, so far as habits, if not structure, are concerned, is to be found in the Short-eared Owl, for during the spring and summer months it much resembles the Harriers; it nests upon the ground, and may be observed hawking for prey with buoyant flight over the marshes and moorlands in full daylight. Though one of our rarer British breeding birds, its numbers are greatly augmented in autumn, and throughout the winter it is somewhat gregarious, arriving here from more northern climes at about the same time as the Woodcock.

All other British Owls—Barn, Tawny, and Long-horned (for long-*eared* is rather a misnomer, the feather tufts on the head having no connection with the ears)—are all strictly nocturnal, and hence more often heard than seen. All are specially equipped with soft plumage for noiseless flight, and all have lovely large and cat-like eyes, which they blink strangely when aroused in daylight. The Tawny or Brown Owl hoots loudly and resonantly; the White or Barn Owl, which is by far the most common, hisses, snores, and shrieks; whilst the Long-horned Owl mews and barks. The iris of the Barn Owl's eyes is black, that of the Tawny Owl dark blue, whilst in all other species it is yellow.

OSPREY.

SHORT-HORNED OWL ON NEST.

This brings us to the end of the first great division in the Linnean list. We come next to the large group of Sparrow-like or Perching Birds, which is headed by the Shrikes or Butcher birds—veritable Hawks on a small scale, save that in neither power of flight nor vision are they so specially adapted for raptorial pursuits, their prey consisting of comparatively helpless and smaller deer. We have only two representatives of this family that are at all common, the Red-backed Shrike in summer and the Grey in winter. The latter is the larger bird, and far less frequent. The male of the former—not quite so large as a Thrush—is a lovely bird, with semi-hawklike black beak and forehead, grey hood and mantle, black eye stripe, rufous back, and black and white elongated tail, with pale grey underparts with roseate tinge on breast. These birds have a curious habit (which has won for them the alternate name of Butcher birds) of spitting spare food—humble-bees, beetles, and even mice and nestling small birds—upon the thorns of Sloe or May bushes around their nests. These larders sometimes betray the whereabouts of their somewhat roughly constructed nursery.

The Spotted Flycatcher, so fond of yearly nesting near, if not upon, the trees trained on the very walls of our houses, and whose pretty habit of hawking for flies from a favourite perch within sight of our windows renders him one of the most observed of all our summer visitors, is perhaps the last bird that has any regular method of feeding which connects him with the birds of prey, and that merely consists in the aforementioned habit of insect hawking. From him we pass on through the Thrushes, Chats, Warblers, Tits, Wagtails, and Pipits (all of which—except the Tits, who make use of their feet—have a notch in their upper mandible to assist in holding and dissecting their food), to the hard and cone-shaped beaked families of Larks, Finches, Starlings, and Crows, which we will sift later on.

The third and last division of perching birds—that is, those birds which, with few exceptions, to be referred to hereafter, have the hind toe and claw well developed for grasping the branches of trees—consists of wide gaped birds, including the Swallows and Goat-sucker or Nightjar, both of which families take their food on the wing—the former by day, the latter by night. Next we come to the climbers—Woodpeckers, Creeper, Nuthatch, Wryneck, and Cuckoo, all of which have the feet especially adapted for clinging to the bark of trees.

YOUNG TAWNY OWL.

The fourth order includes the Pigeons and Game birds; the latter being practically ground dwellers (Wild Pheasants frequently preferring to roost thereon), lead us easily on to the shore birds and waders, five families of more or less long-legged birds with curiously specialised beaks beautifully adapted to the nature of their food and their

YOUNG LONG-HORNED OWL.

various methods of procuring it. All of these birds are able to swim should occasion require it; the feet of some are fitted with incipient webbing. This feature, of course, is fully developed in the true water or swimming birds, the last of the six great orders, which includes the Ducks, Geese, Swans, Divers, Auks, Pelicans, Gulls, and Petrels.

Thus all British birds may be divided into six great divisions: birds of prey, perchers, climbers, walkers, waders, and swimmers, each order being again split up into families and sub-families or species.

Before proceeding further, a word of warning is necessary as to the use of the prefix "common" in the description and identification of particular birds. At best it is of little value, and sometimes very misleading. For instance, when we speak of the Common Kite, or of the Common Buzzard, we are talking of a state of British bird life which passed away some two hundred years ago. The Common Bunting is nowhere the most common representative of its family, nor is, perhaps, the Common Gull; whilst the Common Skua is no longer, if it ever were, frequently to be found in any county; and even the Common Crossbill is comparatively rare.

MAURICE C. H. BIRD.

RED-BACKED SHRIKE ON NEST.

HOW TO KNOW THE TREES GROWING IN BRITAIN

With Notes, descriptive and photographic, for their Identification in all Seasons of the Year

By HENRY IRVING

I.—THE BEECH AND THE OAK

"What we want is the meaning, the character, the expression of a tree, as a kind and as an individual."—O. W. HOLMES.

THE particular trees of which the following chapters treat are such as may be commonly met with in Britain. Some are native, whilst some are of comparatively recent introduction, but these may be regarded as naturalised.

The descriptive notes are written from the standpoint of an ordinary observer whose interest is in the trees as living creatures, not for their commercial or other uses.

The illustrations selected are mainly those which shall best help in the matter of identification, and especially in the winter season when this is beset with the more difficulty. They comprise the winter appearance of the tree, of the twig, of the resting bud (this last enlarged somewhat so that the more minute markings, leaf scars and leaf traces, may be the better noted); the summer appearance of the leaves on a portion of the clothed twig; and, for any season, the appearance of the lower part of the trunk, showing also the surface and texture of the enclosing bark. These in their season, with such detailed aid as may be derived from the descriptive notes, will, it is believed, generally suffice for purpose of identification at any time in the year.

A note of warning is required in reference both to descriptions and illustrations. Trees are living creatures; they are not cast in moulds like iron palings. They are subject to many influences, hereditary and circumstantial. They have decided individuality. Variation may meet us at any point. No individual tree is true to type, at one and the same time, in every particular.

The main division of the trees here is into (1) broad-leaved trees (Beech, Oak, etc.), and (2) narrow-leaved trees (Pines, Firs, etc.). The broad-leaved trees are again divided into (1) those with inconspicuous flowers, mostly gathered together into catkins, lacking flower-leaves (or petals), which accept in the main the service of the wind for the conveyance of the pollen dust from flower to flower; and (2) those with conspicuous flowers, growing singly or in clusters, having petals white or coloured, secreting nectar, attractive to bees and other winged insects, to whom they look for the conveyance of the pollen as required.

It is hoped that these following notes, descriptive and photographic, will serve as aids to those who desire a closer acquaintance with our common trees; ability to distinguish one kind from another at any season; some knowledge of their individual character and habit; and, added to these, the attainment of a sympathetic regard for them, through grateful appreciation of their gentle companionship and generous service.

THE BEECH

The Beech, growing in the open, is a stately, luxuriant tree, with oval-shaped crown, and branches reaching almost to the ground. One amongst many in the forest, its stem rises as a plain column

"THE BEECH IS A MONOPOLIST . . . STAKING OUT ITS CLAIM AND HOLDING ITS OWN AGAINST ALL COMERS."

A WINTER CARPET OF LEAVES UNDER BEECHES.

some 50 or 60 feet without a branch; and its diminished crown, joining with those of its immediate neighbours, be-

tracery of finely tapering twigs on ascending branches. In young trees, and on the lower limbs of older ones, in

A BEECH IN WINTER TIME.

comes part as of a deep canopied roof over cathedral aisles. By nature it is extremely masterful, a monopolist bred and born, persistently, as it were, staking out its claim, and holding its own against all comers. It casts so dense a shadow that few plants can grow beneath it.

In *winter* the Beech shows a delicate

sheltered situations, the dry leaves of the previous summer long retain their hold, and glisten and rustle even till the new spring opens. Where the leaves have fallen the rich bronze carpet which they make under the denuded Beeches, with the grey stems of the trees contrasting, and the long shadows stealing across,

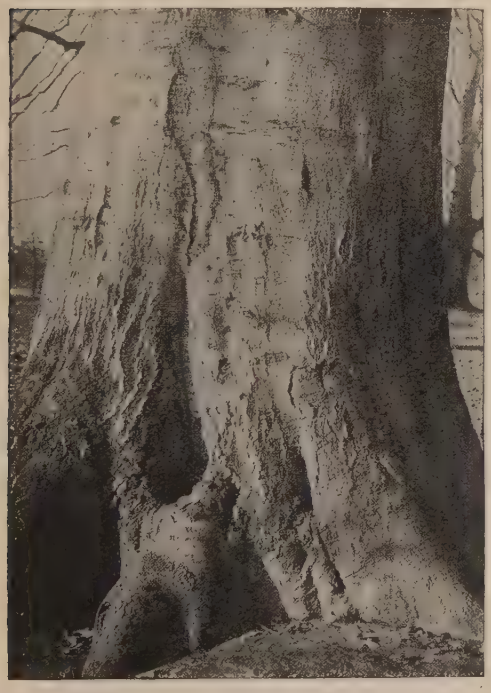
is full of warm light even in winter days.

As *spring* draws on, the tree, by reason of its changing buds, assumes almost a ruddy hue, to be followed by the pure emerald of the first unfolding leaves, till these attain full growth with deeper but yet translucent shadow.

With the full *summer* the closely-fitted mosaics of leaves, in ascending tiers, thickened and opaque, yield to the wayfarer most grateful shade as of twilight at high noon, forming under widespread expanse an oasis of coolness also amid the surrounding midday swelter. For every leaf with its shining surface throws back excess of light and heat.

In *autumn* the peculiar glory of this tree appears when, robed about with leaves whose green is changed to ruddy gold, it lightens the landscape as with a flame; on dull days fairly simulating sunshine, on bright days gathering in and intensifying the day's brightness.

It will be useful now to give some details as aids to identification. These, taken more or less together, according as they are available, will serve to distinguish the Beech from other trees in any season of the year.

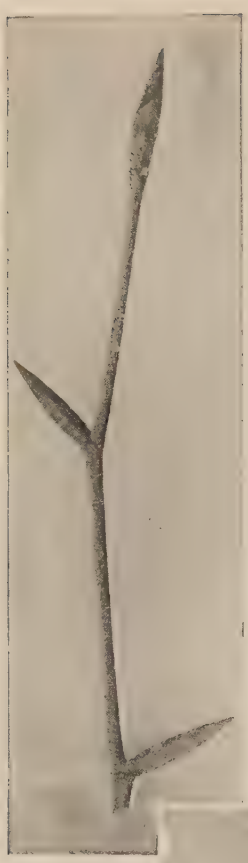


TRUNK AND BARK OF THE BEECH.

BEECH LEAVES.

The *trunk* is cylindrical but broadening at the base, as with prehensile claws that grip the ground, assuring firm foothold. The *bark* is thin and smooth, and fits like a skin over moulded trunk and limb. It is olive grey in colour, almost lustrous, with exquisite gradations of tone. The winter *twigs* are smooth, of varying shades of brown, distinctly zigzag, long, and slender. The resting *buds*, placed alternately on either side of the twig, are spindle-shaped. They stand out boldly from the twig at each angle of its zigzag. They are protected with numerous firm scales of a pale brown colour. As the bud expands, putting forth its young leaves, these scales separate and fall off, as small brown caps. Beneath each bud on the twig is the small healed wound, the "scar," where the leaf of the previous year was attached. This in the Beech is elliptical in shape, and shows three small "traces" where the severed tubes that passed from twig to leaf have been closed.

The *leaves*, when first emerging, are delicately fringed with silky hairs. Later these fringes disappear. The full-grown leaf is oval in shape, and pointed somewhat, clear dark green, and glossy. It has a slightly wavy outline. The midrib



WINTER TWIG OF BEECH SHOWING RESTING BUDS.

runs in continuation of the stalk direct to the apex; the side ribs branch off alternately, and run in parallel straight lines to the margin.

The pollen-bearing *flowers* are distinct from the fruit-producing *flowers*, but they appear on the same tree. They grow out at the junction of the young leaf-stalks with the new shoots. The pollen-bearing flowers are crowded together into rounded bunches, which form

RESTING BUD OF BEECH ENLARGED, SHOWING "SCAR" OF PREVIOUS YEAR'S LEAF.

small clusters, hanging freely by long slender stalks. The work of these flower bunches is to produce the fine yellow dust, or pollen, by which fertilisation is achieved. This pollen is scattered abroad by the wind, and so conveyed to the fruit-producing flowers. Their work accomplished, these bunches drop off and for a time litter the ground beneath. The fruit-producing flowers are enclosed in a green sheath having the appearance of a larger bud with short bristles attached. This grows higher up the shoot, and stands erect on a shorter stalk. When it has reached a certain stage of maturity, its two contained flowers receive and retain some of the wind-blown pollen from the myriads of pollen-bearing flower clusters. Then commences, and continues, the vital process by which eventually the mature fruit is produced. Nearly all our large trees, as we shall see, depend thus upon the wind's agency for the conveyance of the pollen from the pollen-bearing to the fruit-producing flowers.

The *fruit*, when ripe, is contained in a hard bristly capsule. This capsule splits open crosswise, its points bend backwards, and two three-sided nuts of a deep chestnut colour are exposed. Some of the empty capsules often remain on the tree for a considerable time.*

The only tree at all likely to be mistaken for the Beech is the Hornbeam. Points of difference will be indicated in the account of that tree.

THE OAK

The Oak has a rounded, spreading crown. Its general character is that of sturdy endurance and strength. Estimating its age by centuries of years, in maturity it stretches out below great boughs, horizontally, in defiance of gravity, basing its semi-circular crown with almost a straight line drawn parallel to the ground. The radius of that semi-circle may be a hundred feet and more. Its supporting stem, with expanding base, is built, massive and strong, to endure alike downward pressure of solid weight and side strain from force of tempest. Smeaton was well advised in taking the stem of the Oak as his model in designing the Eddystone Lighthouse tower, against which beating wind and bombarding wave should deliver vain assault.

In *winter* the great branches stand out twisted and gnarled, zigzagging in a way peculiar to and wholly characteristic of the Oak, multiplying elbows, knotting

* Only the external appearance of the flowers and fruits is indicated in these notes. For illustration of these, and a clear account of their structural details and meaning, the reader is referred to "Trees and their Life Histories," by Percy Groom. Illustrated from photographs by Henry Irving. Cassell & Co.

BLUEBELLS IN AN OAK WOOD.
From the Water-Colour Drawing by Mrs. Rawnsley.

these to hardness, never flinching nor failing of their purpose from their place of junction with the main stem to their clustered twigs at the extremities.

Spring opens out till most other trees are approaching full leafhood; but the Oak, with masterly reserve, gives no sign, save by the spreading of a ruddy glow over all its surface with the brightening of its multitudinous bud-clusters. Only when the season is well assured will a closer observation show that the deepening ruddiness of the whole has come of the first thrusting forth of new twigs and tiny leaves; a ruddiness which turns to green and gold as the tasselled catkins of the pollen-bearing flowers enlarge and droop amongst the increasing foliage.

By *midsummer* the tree is in full leaf. The withered pollen-bearing catkins, having done their work, litter the ground. The leaves, growing in rosettes and clusters, are bright green; they gradually darken in tint. Then, in the advanced summer, a new process begins. Many buds that did not open earlier now start into activity, expand, and break into leaf, so that, scattered over all the broad expanse of darkened green, are the ruddy tints and fresh brightness of young and growing leaf rosettes.

In *autumn* the fruits are plainly manifest, changing to ripe brownness in their green cups. The greenery of the Oak still persists, after most other trees have assumed their autumn tints and some have lost their leaves; the Oak, as it were, winning reward for spring's reserve by longer maintenance of summer's crown. Finally, the green changes to russet brown, the dried leaves for the most part retaining their position till late gales clear the twigs. But on young trees the dead leaves often stay till the new spring opens.

THE COMMON OAK IN WINTER.

The *trunk* is, as described above, columnar as a lighthouse tower, built for endurance, thicker at the base, and thickening again where division begins and the great lower limbs project. The *bark* is thick and deeply furrowed, in age becoming knotted and gnarled. It is light grey in colour, often rendered

still lighter by thick growth of silvery lichen. The *twigs* are comparatively short and stout, usually brownish. The *resting buds* are spirally arranged, becoming crowded and clustered at the tips of the twigs. They are thick-set, and stand, on projecting bases, well out from the twig.

TRUNK AND BARK OF OAK.

They are brown in colour, showing numerous protecting scales. The *scar*, where the previous leaf was attached, is somewhat shield-shape, having three sets of clustered traces where the leaf-tubes have been severed.

The *leaves* are oval in general outline, narrowing towards the base; but the general outline is deeply indented, making six to eight well-marked, rounded divisions. The midrib passes direct to the apex; the side ribs branch alternately and pass to the farthest away curves of the divided margin of the leaf. The stalks of the leaves, if any, are very short.

The pollen-bearing and the fruit-producing *flowers* grow on the same tree, but are distinct. The pollen-bearing flowers begin to emerge before the leaves, but as they expand the leaves also appear. Presently they hang down as clusters of catkins, 2 to 3 inches in length, like strings with unevenly-threaded golden beads. Later, and higher up on the young growing twig, at the junction of leaves and twig, appear the small stiff catkins of fruit-producing flowers. These are in shape like short erect spikes, having on them from four to six projections of pin-head size, which are the flowers. The pollen is carried from the pollen-bearing flowers to the fruit-producing flowers by the wind's agency.

TWIG AND RESTING BUDS OF OAK.

The well known *fruit* of the Oak is the oval-shaped acorn in its embossed cup, attached, two or more, to a considerable stalk, the outgrowth of the short erect spike which carried the fruit-producing flowers. When ripe the brown fruit falls, leaving the cup still attached to the twig.

There are *two varieties of the Common Oak*. The one, as described above, has stalked fruit-producing flowers and stalked fruits. It is named accordingly the "pedunculate," or stalked, Oak, and is the commonest of Oaks in the Midlands and South. Its leaves are practically stalkless. The other has stalkless fruit-producing flowers and stalkless fruits; these "sit," as it were, (sessile), close down upon the twigs, and so this is distinguished as the "Sessile" Oak. Its

LEAF SCAR OF OAK.

LEAVES OF TURKEY OAK, COMMON OAK, AND HOLM OAK.

leaves have fairly long stalks. This variety is more common in the west and north.

Some mention must be made here of the curious growths upon the Oak known as *galls*. These are the result of irritation caused by certain wasp-flies, which lay their eggs, accompanied by some irritant secretion, in various parts of the tree. The abnormal growth resulting becomes the shelter and feeding-place of the grubs till they are fully matured. One of these is the Oak "apple," so named from its likeness to that fruit, round and rosy, appearing with the early leaves. Another is the "currant" gall, attached to the drooping catkins of the pollen-bearing flowers, often several on a stalk and several stalks in a cluster, suggesting a bunch of currants. On the back of the leaves may be found others, one round and red like a cherry and so named "cherry" gall; others flat, rounded, brown or red, crowded together, and known as "spangles." Another gall, which is the outgrowth from an Oak bud, is itself like a curiously enlarged bud, the appearance of which is indicated by its usual designation, "artichoke" gall. Then there is the "marble" gall, hard, green at first, changing to brown, growing out of the substance of the twig, to which it still adheres after the fly has escaped.

FRUIT OF TURKEY OAK ONE YEAR OLD AND FULL GROWN.

There are, besides, many other kinds of Oak in cultivation. Two only of these need here be briefly described, and their details set forth in comparison with those of the Common Oak. They are the Turkey Oak and the Holm Oak, trees which, though rarer, are yet not unfrequently to be met with in parks or gardens.

THE TURKEY OAK

The Turkey Oak is also known as the "mossy-cupped" Oak, from its very distinctive fruit-cup. This tree has the general characteristics of the Common Oak, but its tendency is to grow more uniformly upright rather than spreading. Its branches are less twisted, its twigs longer. Its *bark* is darker in colour. Its *buds* are more

pointed, and have often, especially the terminal ones, attached to them thread-like appendages, the remains of certain leaf-like growths (stipules), from the previous season. Its leaf-scars are smaller, elliptical in shape, showing five to seven small leaf-traces, not grouped as with the common Oak, but extended in a curved line. Its *leaves* are stalked, as are those of the Sessile Oak. The leaf-margins are more deeply and sharply divided, often cut, as it were, down almost to the midrib, with the appearance of having been snipped away. Its *flowers* are similar to those of the Common Oak, but the pollen-bearing catkins are longer and more conspicuous. Its *fruit*, which scarcely grows at all during the first season, but remains as a tufted bud till the following spring, must be looked for then on the wood of the previous year. In the new summer it grows its "mossy" cup, which, sitting firmly on the twig, has the appearance of a doll's pin-cushion. Later, the point of the enclosed fruit emerges out of the centre of the cushion, grows out to a full-sized acorn, ripens to brownness, and falls.

TURKEY OAK IN SUMMER.

THE HOLM OAK

The Holm or Holly Oak is a smaller tree and evergreen, rounded, somewhat bush-like in appearance. Its *leaves* are thick and tough, dark green above, lighter beneath, oval in outline, often toothed, and shaped more or less like those of the Holly. They are spirally arranged on the twigs, and remain attached during two seasons, falling in the spring time. *Flowers* and *fruits* are much like those of the Common Oak, except that the pollen-bearing flowers are lighter in colour, and hang in shorter clusters; the fruits are relatively longer and sharply pointed, and so fully enclosed within the tightly-fitting cups that little more than their tips emerge.

HENRY IRVING.

THE GARDEN, TERRINGTON HALL, YORK.

THE DELIGHTS OF THE GARDEN

By H. H. THOMAS

"FLOWERS," says Ruskin, one of the greatest writers on the beautiful in Nature, "seem intended for the solace of humanity. Children love them; quiet, tender, contented, ordinary people love them as they grow; luxurious and disorderly people rejoice in them gathered. They are the cottager's treasure; and in the crowded town, mark, as with a little broken fragment of rainbow, the windows of the workers in whose hearts rests the covenant of peace." Here is a tribute to that real love for flowers and gardens that lies somewhere in the hearts of all of us. Deep, deep and downtrodden though it may be by heavy toil in crowded cities, buried beneath years of weary struggle in sunless tenements, it yet lives and ever and anon bursts forth in a glory that gains an added radiance from the unnatural surroundings that encompass it. The depth and vigour of its ramifications are betokened now and again by an occasional bursting into bloom amid strange and sad environment, never more pathetic than when the red-coated geranium and creeping jenny light up the window-sills in courts and alleys upon which the sun scarce ever shines. Was that inborn love for flowers ever more pathetically and more wonderfully shown than by the artisan in the Midlands, who, as recounted by Dean Hole, removed the very coverlet from his bed to protect his favourite plants from frost?

No branch of Nature Study has a finer

or more ennobling influence than that of flowers and gardens. Innate in every baby mind, a love for these needs only a fostering care to bud and blow and bear fruit that shall bring joy to the mind, and gladden the heart, through hours and days of worldly trouble. It is essential for the happiness of the individual, for the good of the race, that we should keep as close in touch with Nature as circumstances will allow; never was it so important as in these days of frenzied stress and storm, when the struggle for supreme positions, and alas! even for the wherewithal to live, is keener than ever before. It is good to turn for occasional moments from the bustle and hurry of life in towns and cities and contemplate the wonders of the world of Nature. It is good, even though to the warped and crooked mind it brings no earnest, heartfelt joy, touches no responsive chord, for it can hardly fail to bring home to one the fallibility of human agency, the unreality, the swift passing of man's handiwork. While, also, it must compel an appreciation of the unfathomable mystery that enwraps the simplest of Nature's problems. Who, for instance, can watch a seed come to life, slowly yet unerringly grow to flowerhood, ripen and fade, and not marvel at the secret of its progress, or cogitate upon the power that guides its growth safely to a predestined end?

Wordsworth, who sang so sweetly of the beauties of Nature among which he loved to dream, felt the subtle, the enthralling fascination that attaches to the life-history of the tiniest plant or flower. It is he who writes:

"To me, the meanest flower that blows can give
Thoughts that do often lie too deep for tears."

Shakespeare, whose wide knowledge was only equalled by the skill and charm with which he outlined his thoughts, often wrote of the deep delights of time spent among the flowers and woodland trees, far, far from the madding, crowded haunts of man:

"And this our life, exempt from public haunt,
Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

And how inexpressibly great is the variety in the world of leaves and flowers. "To the attentive eye," says Emerson, "each moment of the year has its own beauty; and in the same field it beholds every hour a picture that was never seen before, and shall never be seen again."

A love for the flowers of the field, which may be accounted among the rudiments of Nature Study, is a certain pathway to the possession of a garden. From seeing and getting to know the plants of field and furrow, of hill and dale, of ditch and hollow, comes the desire to portray, if upon ever so small a canvas, some of the gorgeous pictures that Nature paints with generous brush. Nature mixes her colours with no niggardly hand—did the landscape gardener's art ever rival the fair beauty of a field in Poppyland or an autumn-tinted woodland hill, majestic tapestry, fresh woven from Nature's loom? We can but follow humbly in the steps of Nature's inimitable ways, remembering, after all, that the art we seek to pursue "itself is Nature."

Gardening is an art of which there are many phases. Everyone who practises its teaching pictures his own ideal garden, and in its capacity to please its creator it vindicates its right to be considered. It is in the varied ideals to which its practice gives rise, that gardening justifies Lord Bacon's dictum that "A garden is the purest of human pleasures; it is the greatest refreshment to the spirits of man." In his attempt to reach the ideal set up, the gardener finds real delight, and, paradoxical though it may seem, in its impossibility of attainment lies an equally potent source of pleasure.

True gardening, gardening for the real love of the thing, may be described as an attempt to attain the unattainable. There is no perfect garden, and so it is but human and, being human, natural that we should continually strive after its fashioning. In our striving we may find a charm equalled only by the delight that throngs in upon us when, as we imagine, we have achieved our purpose, the making of an ideal garden—ideal, that is, to our own individual and limited horizon.

During a talk on gardens and gardening with one who, it is admitted, has come as near to the making of a perfect garden as anyone may hope to do, the question was

asked, "Where, can you tell me, is there a beautiful garden?" The question seemed simple at the time, and I readily named several that are on the tip of everybody's tongue. But my friend would have none of them held up as a beautiful garden. Probably he was right if in this case we allow the literal meaning of beautiful—full of beauty—and license ourselves to consider that a garden full of beauty must be a perfect garden. But does not this remark from one of the masters of the craft emphasise the futility of attempting to raise a standard whereby the Garden Beautiful may be judged? He would seem a bold man who would criticise the garden craft of Paxton, of Ingram, of Wildsmith, yet it would be equally bold to assert that the cottage garden (designed with care and planted with pleasured skill by its humble owner) were not beautiful. To him it is perfect, and to the master minds of Paxton and others the gardens of their own fashioning could not have been more, and might well have been less. The rose-coloured spectacles of enchantment are essential to the full enjoyment of one's own garden.

The association of gardening and good fellowship is proverbial; it offers a common meeting ground for high and low, for rich and poor. Round about the platform of roses and hardy flowers, rock plants and water plants, the learned great become as little children, to be instructed by those versed in the ways of the craft. And what depth of charm centres in the smallest plant is only discovered when one inquires into its perverse and hidden ways. How self-willed are some of the tiniest plants! Provide conditions in which they delight, and they reward you with bright leaves and brilliant blossom. Deprived of the luxuries upon which they have come to look as their right, how sulky they are! and how offended! Even the most robust of border flowers have their likes and dislikes; if, as becomes

Photograph by F. Mason Good, Winchfield.

STRATHFIELDSAYE RECTORY GARDEN.

A SUCCESSFUL SUBURBAN EFFORT AT A WINDOW GARDEN.

the giants of their race, they disdain to pout and show annoyance in ways excused to fragile plants, there is no comparison between their good behaviour and their best.

The realisation of the impossibility of finality in garden knowledge is forced upon one at every turn. One learns much only to find there is more to learn. Beware of the gardener who tells you that he knows his plants. Be sure that sooner or later his cocksuredness will lead him deep into pitfalls. Did one live to the age of Methuselah there would still be lessons to learn in the world of leaves and flowers. There is no finality here ; there is no last page, no final leaf to turn. The greatest lesson to be learnt in its vast wonder tome is that of deep humility.

To search into the ways of garden flowers gives keen delight, yet their superficial beauty gives, perhaps, the greatest store of charm to many people. The Snowdrop piercing the frozen ground (what strength, what marvellous power in its tiny shoot !), Daffodils shimmering gently in the faintest breeze that blows, Tulips painting the ground with gladsome colours, and so on through the pageant of gaudy summer blossom, soft-toned autumn flower and winter's scanty bloom—each and all in their turn appeal irresistibly and with deep fascination even to the untutored mind. Can it be said with truth that they are the most fortunate who are content to drink only of the surface joys of gardening ?

Lord Rosebery has said of gardens, " I am not sure that this is not one of the cases in which the ignorant have almost the best of it. I admit that when I walk with an expert through a garden I feel an ignorance, a humiliation which is almost abysmal. But I recollect, after all, that I may be the happier of the two. The expert knows all the weaknesses and the shortcomings in his garden. On the other hand the ignoramus walks blandly along enjoying without cavil the simple beauty of the flowers, enjoying what Lord Bacon has so finely called their breath, enjoying all their perfume and all the variety which a garden can give without question and without afterthought."

Yet to praise the picture is not to know of the days and weeks of patient labour that have gone to the mixing of the colours ; none but those who have worked towards its completion realise that the chief joy comes not when the work is done but rather in the doing.

Gardens are like faces ; there are no two alike in the wide, wide world. Even the uncountable gardens in the suburbs, similar in size, aspect, and in other particulars, have a certain individuality, each reflecting, to some extent, the character of its designer. As the human face is an index of the mind that works beneath the mask of flesh and blood,

so the garden is often an indication of the temperament of its maker. One might almost judge a man by his garden. A generous, benevolent disposition would show itself in the planting of broad, effective masses; ribbon borders and flower beds of geometrical design would appeal to those of methodical turn of mind; an indiscriminate dotting of similar plants in various positions might be expected to show a love of fine display, but a lack of knowledge and method in making the most of opportunities. One might suggest other analogies with the certainty that, more often than not, they would be in accordance with the facts.

A most satisfactory reflection is that for centuries gardening has been a joy and perfect relaxation to the hard-worked and harassed, and especially, perhaps, to the literary man. One of the saddest figures in the whole history of English literature is that of Alexander Pope. Deformed and crippled from birth, denied many pleasures common to the majority of men, the life of Pope demands much sympathy, in spite of the bitter and vengeful spirit that animates much of his writing. How excellent it is to know that Pope, the genius, the cleverest man of letters of his generation, found solace in the simple delights of gardening in his home at Twickenham.

"This garden," says Horace Walpole, "was a little bit of ground of five acres enclosed by three lanes. Pope had twisted and twirled and rhymed and harmonised this till it appeared two or three sweet little lawns, opening and opening beyond one another, and the whole surrounded with impenetrable woods."

Apparently Pope preferred the informal to the formal garden, which he thus satirises in his description of Timon's villa:

"His gardens next your admiration call,
On every side you look, behold the wall,
No pleasing intricacies intervene,
No artful wildness to perplex the scene;
Grove nods at grove, each alley has a brother,
And half the platform just reflects the other."

"The picture of Pope amusing himself with his plantations, directing old John Searle, his gardener, and conversing with

HONEYSUCKLE AND CRIMSON RAMBLERS.
A "back-yard" Garden, Wollaston, Northants.

the friends whom he compliments so gracefully, is," wrote the late Sir Leslie Stephen, "perhaps the pleasantest in his history." Can we, then, be too grateful to gardens and gardening that brought joy into the crooked life of one so great as Alexander Pope ?

landmark on the path of life, where every flower is hallowed by associations that seem to stand out in greater relief, clearer and more precious, as hours are lost in days, and weeks pass swiftly into years.

The only other garden that can com-

A COUNTRY HOUSE GARDEN: "WIGGANTHORPE," YORKS.

After all, a garden fails in its purpose unless within its friendly shade we find an abiding sense of exquisite peace, a solace that soothes, a balm for worldly care. And where can these be found in greater degree than in a garden, providing it is a garden that one loves ? To know the real charm of a garden one must have grown up with it or have made it. A garden around which are entwined the thoughts of childhood and early youth—seeming to us, over the bridge of years, to be the happiest time of life, a time when the world of actuality was enveloped in a golden halo of eager anticipation—this is, perhaps, the most perfect garden one could wish to have. But how very few of us can hope to live and die in that old-world garden, where every bush and every tree is a

pare in any way with this is the garden made with one's own hands, and tended with fostering care, in which one may bring again to life the dreams of youth, and re-people with memory-faces the dimmed and distant past.

The making of a garden in which the spirit of peace may find a rest, implies, at first, much care and self-denial. It implies much tender nurturing of fragile slips, of wayward seeds, of gentle reproving of overbearing plants that would usurp the ground that is not theirs by right. There is no delight in gardening comparable to that found in plants that one has grown, tended from babyhood and brought healthily to prime. The associations of a garden cluster round the life-histories of its plants and flowers —the Moss-Rose from the border of some

close friend; the home-saved seed; the old Clove Pink, rescued from oblivion by timely thought; a Fern from cool, sequestered lane that lingers in some untroubled corner of the mind, to which, sometimes, one turns, and not in vain, for soothing memories—all these and many more should be found in the garden that one loves.

How difficult it is to make a garden that shall be more than a mere collection of plants—a garden haunted by the spirit of other days, peopled by ghosts of welcome memory, lit by stray shafts of mellowed light from gladsome times bygone; a garden that shall have *soul* as well as body! In what melodious words does the Poet Laureate, in "The Garden that I Love," picture the choice of gardens, gardens for young, gardens for old. I quote only the first four lines of each stanza:

"Had I a garden, it should lie
All smiling to the sun,
And after bird and butterfly
Children should romp and run.

"Had I a garden, alleys green
Should lead where none would guess,
Save lovers, to exchange, unseen,
Shy whisper and caress.

"Had I a garden, claustral yews
Should shut out railing wind,
That poets might on sadness muse
With a majestic mind.

"Had I a garden, it should grow
Shelter where feeble feet
Might loiter long or wander slow
And deem decadence sweet."

To make a garden that shall closely approach one's ideal it is best to let the flowers grow much as they list, to let wild Nature have her way, even on well-tilled ground. A little of rose-gardens, of wild gardens and water gardens, of rock gardens a little, and a little of flower gardens, if carefully blended, would blossom into a pleasaunce full of charm if the tending were with care and not precision, with love yet not with affectation, with pride yet not with proudness, with tenderness not lacking in firmness. Before attempting to blend the one with the other, it is well to know something of the ways of plants, their likes and dislikes, their good points and bad, so that one's knowledge of the individual flowers may stand the final and supreme test of their association in a garden where the plants shall not only grow but live, and in living give of the pure joy that is within them.

H. H. THOMAS.

HOW TO KNOW THE INSECTS

By JOHN J. WARD, F.E.S.

Author of "Some Nature Biographies," "Peeps into Nature's Ways," etc.

Illustrated from Original Photographs by the Author

THE AWAKENING OF SPRING

HOW to discover and distinguish the insects is always a puzzling matter to the amateur naturalist. Insect species are very numerous; indeed, so numerous that they are said to outnumber those of all other land animals put together. The would-be student of insect life has, therefore, an immense field in which to work; and yet there are people who, while most desirous to understand the wonders and workings of the insect world, complain that when out on their country rambles they rarely are able to find anything of interest. To such the practical entomologist appears to be endowed with some supernatural gift; and when he suddenly removes a dead bird lying in the path and collects some pretty black and orange-striped beetles from beneath it, he becomes a complete mystery-man, for, "How did he know that those beetles were under that bird?" The explanation is very simple. The entomologist differs from others only in that he has learned to use his eyes a little more; or, in other words, he has cultivated his observing faculties a stage farther than have his neighbours.

The would-be entomologist has, perhaps, been reading some detailed life-story of an insect; his interest has been aroused, and out he goes into the country full of enthusiasm and determination to investigate things on his own account. His enthusiasm, however, presently begins to wane, and it is very likely he returns home a disappointed and exhausted investigator. During his ramble, for some reason, insects seem to have been particularly scarce. His failure cannot be attributed to want of energy, for he started out expressly for the purpose of finding insects, but, although he has searched high and low, his journey has been almost fruitless; in fact, it might have been entirely so had he not almost stepped upon a pretty caterpillar, which he may be said, therefore, to have discovered quite accidentally.

The intentions of the amateur entomologist are most commendable, but his methods are wrong; indeed, his troubles arise largely from the fact that he has no methods. He expects too much, and wants to accomplish in an hour or two all that the practical entomologist has, by careful and incessant observation, laboured for years to learn. To know the insects, knowledge is required, and, like other knowledge, there is no royal road to it. But let not this dishearten those who would study insect life; the warning is given here only to prevent discouragement as the result of a first disappointment. When the amateur learns that he must proceed slowly by short steps at a time, it is surprising how soon his experience grows, for the minor observations of to-day lead to greater and more interesting discoveries on the morrow.

I propose, therefore, to take some imaginary rambles with my readers, and to endeavour to help them to see insect life in its various phases, dealing more particularly with those common insects which are most likely to be met with by the amateur naturalist during a country ramble. I may, however, occasionally introduce an insect of rare or special interest.

We start on a delightful morning in early May. A lovely blue sky bends overhead, and the cold winds that have

characterised the last few days have given place to an almost balmy atmosphere, while every living thing around us seems to be overflowing with the joyousness of life. Numerous birds are chirping in-

CATERPILLARS OF THE DRINKER MOTH FEEDING ON COARSE GRASSES.

cessantly, the cuckoo and lark are making more decided music, and so, too, are the young lambs. We have but to note the delicate green that now enlivens trees and hedgerows, the bright golden yellow of the dandelion and the lesser celandine, to realise what a marvellous thing is sunlight. All this re-awaking of life and loveliness about us comes in response to the invigorating influence of the energy stored in sunshine. Above and below us life is bubbling forth on every hand.

Here it is in one form on these coarse blades of grass beneath the hedgerow; so coarse are they that, if roughly handled, they will cut the fingers. The tissues of the grass contain quantities of the mineral substance silica, or quartz, and it is this material that inflicts the wound; and yet here we find feeding on these tough, flinty blades some fine grey and yellow-streaked caterpillars, with tufts of white and brown hairs along the sides of their bodies. This conspicuous larva is readily distinguished by its colours, when it is seen feeding on coarse grasses; it is one of the commonest of caterpillars in spring. It eventually becomes the Drinker Moth (*Odonestis potatoria*), familiar about July. These caterpillars are usually hatched from their eggs late in July and feed until October;

then they hibernate in sheltered corners through the winter. About April the warm sunshine tempts them from their winter quarters, and so we find them nearly full-grown in May.

FEMALE ORANGE-TIP BUTTERFLY ON FLOWERS OF LADY'S SMOCK.

Few insects have sufficiently good digestive organs to relish the coarse silicious deposits in the tissues of these strong grasses on which the Drinker Moth caterpillars feed; by cultivating this curious taste, therefore, they have found for themselves a feeding ground which they can enjoy comfortably without being crowded by hungry competitors. It is said of this larva that it will put its mouth to a dewdrop and suck it up; hence the name "drinker." I cannot verify this from personal observation, but it certainly is found most often in damp situations, and, although it is unusual for caterpillars to drink, it would not surprise me that these larvæ should do so, seeing how indigestible their food material must be.

By the ditch, over which the Drinker Moth larvæ are feeding, extends a piece of moist land on which the pale mauve blossoms of the lady's smock are conspicuous. While picking our way amidst the watery ground, what is, presumably, a small White Cabbage Butterfly appears to view. It alights among the lady's smock flowers and is seen to be moving about beneath them; it never attempts to reach the opened blooms where one would naturally expect to see it searching for the nectar. But it is not nectar this butterfly is seeking, it is engaged on quite other business

FOUR ORANGE-TIP BUTTERFLIES.
Showing how they become inconspicuous amongst the umbels of green and white flowers.

When near enough to see the butterfly, the first thing that strikes us is that a great change has come over it. It is no longer a White Cabbage Butterfly, but has become a mottled green and white. This is due to the fact that when the insect was flying we saw the upper side of its wings, which were almost white; now that it has closed its wings over its back we see the under side of the lower wings. It will be well to notice, also, that the butterfly has its feelers clubbed at their ends. Now, clubbed antennæ, or feelers, and wings closed over the back are the two characteristic features of a butterfly. The antennæ of moths always terminate in a point, and these insects usually rest with the upper sides of their

AN EGG OF THE ORANGE-TIP BUTTERFLY ATTACHED TO A FLOWER STALK.
Magnified 25 diameters.

wings exposed Now that we know how to distinguish Moths from Butterflies, we may continue our observations.

The mottled green lower wings make it clear that we are not dealing with a White Cabbage Butterfly, for the under side of the wings of that insect are white or pale yellow. We have here, then, the female of the Orange-Tip Butterfly (*Anthocharis cardamines*). The butterfly is called "orange-tip" because of the large blotch of bright orange colour on the tips of the forewings of the male insect. In the lower illustration on page 46 is shown a male butterfly, the dark tips of the wings representing the orange colour.

Our butterfly has been occupied for several minutes amongst the flowers of the lady's smock, or cuckoo-flowers as they are sometimes called, and now a sudden burst of sunlight has induced it to take to its wings again. Before leaving these flowers, however, let us glance at the work on which the butterfly was employed. Examining the little stalks of the individual flowers by means of a pocket lens (the amateur entomologist should always carry a pocket magnifier, one that can be purchased for a shilling will serve all his needs), we find that the butterfly has placed here and there one of her tiny and beautiful eggs. In the illustration on this page one of these eggs is shown as it appears when magnified. Thus we have the beginning of some Orange-Tip Butterflies for next spring.

Later on, if we carefully examine the lady's smocks when their flowers have changed into long, narrow seed pods, we shall probably find feeding upon them some green caterpillars, very similar in size and appearance to the pods themselves, and these caterpillars represent the next stage of the Orange-Tip Butterfly. It is interesting to note that when the caterpillar has consumed the seed pod from the tip downwards, it rests on the upper part of the stalk, and, being similar in colour and form to the pod, it often escapes the vigilant eyes of its enemies by thus mimicking its surroundings.

In connection with mimicry, the Orange-Tip Butterflies themselves may be noticed as evening approaches. I have previously pointed out the mottled green and white colours of the under side of their lower wings. Now these butterflies frequently rest upon flowers of the wild parsley tribe,

CATERPILLARS OF ORANGE-TIP BUTTERFLIES FEEDING ON SEED PODS OF LADY'S SMOCK.
Showing how the caterpillars resemble the pods.

characterised by their umbels of little green and white flowers. If you will glance at the illustration on page 46 you will notice that, while the butterfly in the centre with open wings is quite conspicuous, the one on the right with partly closed wings

so frequently seen crawling across the garden path, and always appearing to be in a hurry. In the garden the "woolly bear" is very mischievous, but in the country it is generally found feeding on the common white flowering

"WOOLLY BEAR" CATERPILLARS. WHICH EVENTUALLY BECOME TIGER MOTHS.

appears like only half a butterfly, for its lower green and white wings harmonise so well with the flowers that they become inconspicuous. On the extreme left of the illustration is another butterfly with wings still more closed, and this, it will be observed, is still less conspicuous. Between that butterfly and the central one is still another, with wings completely closed, and this has become almost invisible. In this way the Orange-Tip Butterfly evades the eyes of its foes. Even between its caterpillar and butterfly stage, when it becomes a chrysalis, it also mimics its surroundings, as I hope to show you in due season.

Here by this warm wall facing the sun is another familiar insect. Everybody knows the "woolly bear" caterpillar

nettle, or dead-nettle, where it does no harm. It has an artful way of rolling itself into a ball when it is touched, and dropping down amongst the herbage, where it generally escapes, since its long, flexible hairs give way so promptly to the touch and leave its body so readily, that it becomes difficult to pick it up. Although this caterpillar is so familiar, it is, nevertheless, not always associated with another equally familiar insect. I refer to the common Tiger Moth (*Arctia caia*) which appears about July. For it is this beautiful insect that the "woolly bear" eventually becomes.

Another of England's commonest and most beautiful insects is the Small Tortoise-shell Butterfly (*Vanessa urticæ*). This butterfly is frequently, but wrongly, called

the "garden tiger," for, as I have shown above, the "garden tiger" is a moth

A PAIR OF THE COMMON TIGER MOTHS.
The upper one is the male.

and not a butterfly (note its pointed feelers). The Tiger Moth and Tortoise-shell Butterfly are very different in habit. The moth is a night-flying insect, while the butterfly is a creature of the sunlight. The "woolly bear" hibernates through the winter, like the larva of the Drinker Moth, but the beautiful Tortoise-shell Butterfly, frail though it may seem, is hardy enough to live through the rains and frosts of winter as a perfect butterfly, hiding away in the roofs of barns and outhouses, and similar places; and this is why it is one of the first butterflies to make its appearance in the spring; indeed, a warm sunny day in winter will often tempt it to stretch its wings. One individual specimen that came under my notice took up its winter quarters in the roof area of a country church, and on several Sunday mornings during service took exercise, much to the amusement of the congregation. After it had appeared several times, it was suggested to me by a worthy member of the congregation that it must be the music that it liked, as it appeared to fly only on Sunday mornings. Personally I rather doubt the accuracy of that suggestion. It was much more likely that the butterfly appreciated the increased temperature of the building during service hours—even though the music may have been of the highest quality.

It is clear then that the various insects spend the winter very differently. Later, we shall find that other insects winter in the chrysalis stage, and still others as tiny eggs. In the illustration on page 50 are shown two other caterpillars that have lived through the winter. You may at first have a little difficulty in distinguishing the caterpillars, although they are conspicuous enough as they stand on the bare elder twig. These caterpillars are so stick-like that, although they are over two inches in length, they are quite unnoticeable. They are holding on only by their tail claspers, and form an angle with the branch just as do the twigs. The mimicry of the twig here is perfect; for hours at a time these caterpillars will maintain these quaint stick-like attitudes,

SMALL TORTOISE-SHELL BUTTERFLY.

and so completely deceive their enemies. Eventually each of these fraudulent twigs

TWO STICK-LIKE CATERPILLARS RESTING ON AN ELDER TWIG.
Natural size.

becomes a Swallow-tail Moth (*Uropteryx sambucata*).

Some curious spider-like animals with long legs are darting and gliding across the surface of a clear pond, here, in a very marvellous manner. They flash over the water much more actively than most insects move over the dry land, and yet they never seem to get submerged. If a small fly should fall, or is blown, into the pond, you will see them rush upon it; for it is on such small game that they prey. When seen on the water they appear to have eight legs, but this is because their large antennæ, or feelers, look like a pair of legs. A glance at the illustration will show that they have only six legs. This, it should be remembered, is a characteristic feature of insects. In their larval stages insects often appear to have more than six legs, as in the case of caterpillars. Only the three first pairs, however, are true legs; the claspers disappear as the insect reaches its perfect form. These Pond-Skaters have only six legs throughout their development, and do not pass through distinct caterpillar and chrysalis phases. The young differ from the old apparently only in size; although they really possess other differences with which we need not now concern ourselves. Their marvellous powers of movement on the surface film of the water are due to the fact that their legs and bodies are clothed with minute hairs which form a pile that rejects the water. They spend the winter in the adult form, under banks and amongst leaves and stones. In the spring they deposit their eggs amongst the water plants.

Finally, we may glance at two daffodil yellow butterflies sailing along with

A POND-SKATER.
(Gerris najas).
Magnified two diameters.

merry flight. This time it is the Brimstone Butterfly (*Gonopteryx rhamni*), which, like the Tortoise-shell Butterfly,

spends the winter in the winged state. That the butterflies are a pair there is no doubt; indeed, you have only to glance at them, as they fly, to see which is the wooer and which is the wooed. One is distinctly daffodil yellow, the other is paler, being more of a primrose shade. The latter is the female, and in the illustration she is seen on the upper side of the leaf, while her daffodil suitor rests on the lower side; for even after all his bold manœuvres in the sunlight chase of his lady-love, he is not brave with his proposal; perhaps he fears lest his suit may be rejected!

BRIMSTONE BUTTERFLIES LOVE-MAKING.

JOHN J. WARD.

HOW TO KNOW THE WILD ANIMALS

By DOUGLAS ENGLISH, B.A., F.R.P.S.

Author of "Wee Tim'rous Beasties," etc.

THE LONG-TAILED FIELD MOUSE

With Photographs by the Author

THE Long-tailed Field Mouse is one of the commonest, if not *the* commonest, wild animal in this country. I have already described the progress of the infant of this species until the time when it has found its legs—about a fortnight after its birth. For another fortnight it remains an ill-balanced, leggy, bulbous little beast, with a huge head and blobbery mouth. After this it gradually fills out, and in about four months' time has, in all but colour, attained to perfect Mousehood. I have not been able to determine accurately how long it is before the brindle sepia of the adolescent is exchanged for the tawny rufous of the adult; but I have little doubt that the colour change varies somewhat with the season, and that a Field Mouse born early in the year will be a "red" Mouse earlier than one born late. There are changes, also, which seem to depend on the locality and food supply. There is a general tendency in Field Mice to develop a yellow patch on the chest, and the name "Yellow-necked Mouse" has been applied to large, full-blooded individuals in which this patch, spreading backwards and crossways, forms a handsome collar and pendant. I am not sure that there are sufficient grounds for classing the Yellow-necked Mouse as a distinct sub-species, and I am equally diffident as to the standing of other varieties which have been assigned to various islands round the coast. There can be no question, however, as to the interest of these records, and it is curious to find that the St. Kilda and Hebridean Field Mice are *larger* than the ordinary British and Irish types.

A close examination of a wild animal will usually give some idea as to its habits, and this is markedly the case with the Long-tailed Field Mouse. His eyes show that he is nocturnal, his ears show that he is alert, his limbs show that he is athletic.

AN IMMATURE LONG-TAILED FIELD MOUSE.

The eyes of the Long-tailed Field Mouse are remarkably prominent and remarkably large. There is no visible iris in a mouse's eye. All that one sees externally is the fully distended pupil. This in a full-grown Field Mouse measures about four millimetres across, and this measurement is equal to the length of the longest finger in the mouse's hand. A similar proportion in man would make the width of his distended pupil nearly four inches. We can only speculate as to what effect a pupil (with corresponding eye) of this size would have on human vision; but I think we may safely speculate to this extent: that the sensation of light conveyed to the brain would be enormously increased, and that, consequently, our discrimination of light and shade (not necessarily of detail) in darkness or semi-darkness would be much more sensitive.

There is little doubt, moreover, that the eyes of Field Mice have a remarkable range of vision. The normal human eyes embrace a very narrow angle with distinctness, perhaps not more than five degrees. This is compensated for by the fact that they move simultaneously in their sockets, and by this simultaneous movement, coupled with a movement of the head, command a large field. The eyes of Mice are permanently fixed, but their vision, instead of being parallel, is widely divergent. Field Mice have a constant squint of about 140 degrees. Apart from the protrusion of their eyes, this squint means an enormous field of view. Dr. Lindsay Johnson, whose researches on the eyes of animals are extremely valuable and interesting, informs me that the hare and squirrel can, by a combination of both their eyes, see through an angle of 420 degrees—that is to say that, in addition to their ability to see round themselves in a complete circle, the vision of either eye overlaps that of the other to the extent of some 50 degrees in front and 10 degrees behind. I do not think that the Field Mouse is much behind them. His attitude when frightened is instructive. If one observes a Field Mouse who is not frightened from a point somewhat above and behind him, one finds that his eyes are hidden by his ears. If, however, he is frightened, he depresses the nape of his neck and flattens his ears in such a way that their tips converge. Under these conditions, his eyes protrude rather more than usual, and are plainly visible from the same view point. To lose sight of them one has to bring one's own eyes very nearly to their level, when they are hidden by the mouse's back. It is obvious that an arrangement whereby a mouse, when flattened to the earth, can look behind him as well as above and on all sides must be of great advantage to the race. The same tendency to depress the neck may be observed in the Meadow Mice and Water Rat, and I have no doubt that it is usual among the Mouse family.

As may be seen from the illustrations, the Field Mouse's ear is large in proportion to his head—about half the length of it, in fact. At first sight it appears to be

naked, but careful examination will show that it is not so. The outer portion, which is purplish and opaque, is thickly covered with short silky fur, the inner portion, which is pink and transparent, is almost hairless. The ear is situated closer to the eye than is the case with the House Mouse, and this, coupled with a pronounced arching of the nose, gives him a resolute, almost fierce, expression. I am inclined to think that Field Mice, and other small animals, hear a somewhat different range of sounds to human beings. A shrill squeak with the lips will mightily startle a mouse, while a dull, heavy sound, of far greater volume to our ears, will hardly interest him. No doubt a quick ear for squeaks and rustlings has proved profitable to the race. The Field Mouse has an excellent control over his ears, and can prick and depress them at will; moreover, as might be expected from their size, they are extremely sensitive. Before a human being has fairly grasped the fact that a sound has occurred, a Field Mouse will be off and under cover.

A glance at a Field Mouse's limbs stamps him at once as an athlete, and a closer examination shows that both hands and feet are excellently adapted for grasping as well as movement. His feet have the usual eleven pads, one at each toe tip, one between the bases of each toe, and two farther back. Each toe has, in addition, six or seven well-marked furrows across it with corresponding ridges. It is probable that these furrows and ridges are largely concerned with the sense of touch, but they must certainly help him to a secure foothold. Pads and furrows appear also on his hands, though the fact that his thumb is rudimentary naturally decreases their number. The tendons of his toes and fingers are extraordinarily elastic, and, as a result of this, every joint on his hands and feet is in the popular sense "double"—even "treble" sometimes, for some of his finger and toe joints admit of a considerable bend sideways. Each finger and toe is armed with a sharp claw, and in a battle with his own kind these claws are used offensively.

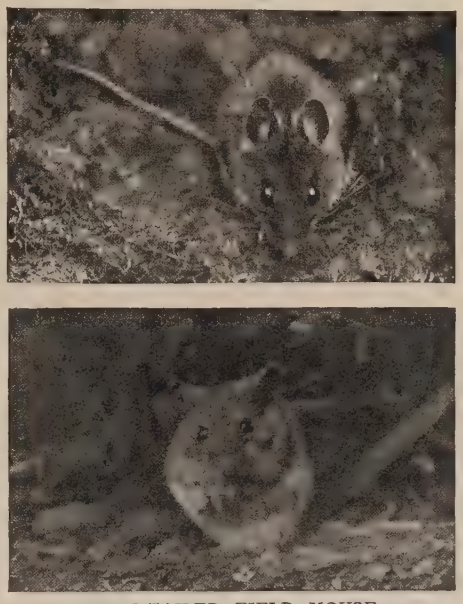
It is somewhat remarkable that, for all his martial air, the Field Mouse is a peaceful little beast. A long list of Mouse fights furnishes me with only one record of an encounter between two of his species—and these were captives.

At large and undismayed, the Field Mouse is worth watching. Sometimes one meets him casually, but from such meetings little can be learnt.

Mouse sights man first, and treats him as a danger.

Yet this is not invariable. Mouse sometimes is engrossed in his own business—his toilet, for example; and sometimes he is half-way up a hedge. He is not so much a climber as a balancer. For choice he runs on gently-sloping branches, his grip clenched tight, his tail stretched taut behind him. He eats most buds and berries in the hedgerow, and it is a pretty sight to watch him stretch on end to reach a dangling fruit. Here his roughed palms and soles must serve him well. There are good records of his amassing a store of food in some old bird's nest (half a pint of hips and haws, says one observer, reckoning by the uneaten husks), and sleeping in the midst of it.

Most small beasts clamber on occasion.



LONG-TAILED FIELD MOUSE.
1. Showing position of ears when frightened.
2. Showing normal position of ears.

I have a note of a Shrew Mouse in a bird's nest some five feet from the ground,

many notes of Field Mice and Red-backed Meadow Mice aloft, but none as yet of Short-tailed Meadow Mice. A good tail seems essential for the balance.

One must do more, however, than trust to chance to study Field Mice worthily. The best plan is to mark their holes. I do not think the hedgerow Mouse is normal. Field Mice are sociable, gregarious folk, and live for choice in small communities a foot or so beneath the surface. The site of some long-fallen tree (whose roots remain) is ideal burrowing ground, and here one may often count on finding Field Mice, Red-backed Meadow Mice, and Shrew Mice together.

The entrances are common ground, but what goes on below one has no means of knowing. There may be disagreements. The association of the three species, however, is so usual that one is driven to suppose that either these disagreements are temporary, or that the room for them is larger than would appear from the outside.

To anyone gifted with good sight the observation of Field Mice, once their hole has been discovered, is not particularly difficult. Even those whose sight is defective can manage comfortably enough with a glass, though they are somewhat handicapped by the need of adjusting it. The golden rule is to remain still, and to do this you must secure an easy position before the mouse appears. Provided you keep still, you may do anything in reason. You may smoke, you may bring your knitting (if you knit quietly), you may bring a friend (if you converse in even tones). So surely as Mouse is at home, and the weather is fit for Mouse to be abroad, so surely will Mouse appear. He has his own set times, and these you must discover. The twilight suits him generally, so does a change to better weather, calm after storm, sunshine after rain, for, though nocturnal, he must have fresh air, and wet or windy nights mean close confinement.

Watch as you may, you seldom see his exit. The human eye, unlike the cat's, grows weary with long waiting. Mind-pictures float in front of it. Yet, if you have kept still, this matters little. A leaf flirts two feet from the hole, and instantly you wake again. You stare intently; all seems as before: the leaf, the hole, the nut you placed beside the hole. Mouse is underneath the leaf, *and watching you.* This is the crucial moment. One wonders what is passing in that brain of his. The sense of the prime danger, man? or just the sense of danger? Man moves with crackling tread and swings his arms. You are quite still and motionless. Therefore you are a tree-trunk. There is a scent of man about, but man's scent clings to everything.

I think this is his reasoning; I gauge it from his actions.

His nose points from the leaf's near side. You feel it sniffing. You feel his whiskers shiver. Then come his eyes, and then he stands forth openly. He stares at you, and you stare back. A long, queer, breathless, spellbound pause, and he prepares to clean himself.

A false start that time; he must look again. Another pause. But now he seems more satisfied. He sits back on his haunches. His wee hands jerk towards his face and, quivering down the length of it, are moistened by his tongue. Thence to his nose and eyes and ears in fluttery, light caresses. Thence to his tongue once more. He twists about and nibbles at his sides, his hands now two unravelling combs which grip the fur and press it to his mouth. He drags a hind-leg forward and, grasping it between his hands, licks it to spotless whiteness. While it still gleams, he plies it on his ear. He backs an inch past his own tail, grips the free end, and polishes the rings.

And all the while, his eyes have never left you.

Keep still the harder; there is more to see.

He starts off running. He runs in dots and dashes—queer little clockwork lightning runs; queer little checks and pauses. He seems to scent the nut. He pokes his nose in likely places. His tail points stiff. He swings this way and that. You try to sight the nut yourself—and fail. Then only does it dawn on you that there are two mice out; one has the nut already. Seeing the pair of them together, you realise that one—the one you have been watching—is small and slim and brown. The other is a full-grown mouse, red-backed, perhaps a Yellow-neck.

Red Mouse is busy with the nut. He sits back slightly, bends his head, and gnaws the shell at random. You cannot call him skilful. Nuts are unstable things and should be lifted. But Red Mouse never lifts his nut. He fumbles with it on the ground, and this means less control. Though teeth and hands work to a common end, the ground deceives his sense of touch and steals the nut away from him. A Dormouse should instruct him.

Brown Mouse is well aware of this, yet creeps up unconcernedly. He really does not care for nuts. Red Mouse wheels sharply right about, and sets a furry back at him. Brown Mouse, quite unabashed, steals past his flank and fronts him. Once more Red Mouse swings round. Once more Brown Mouse steals past. Brown Mouse would have the nut between them. Red Mouse would have Brown Mouse behind him. So they go semi-circling.

Red Mouse gnaws fiercely all the time, but Brown Mouse tires the sooner. He sits behind Red Mouse and thinks. Where boldness fails, guile may succeed.

He squirms beneath Red Mouse's tail. Red Mouse tilts up obligingly (Mice love to sit in heaps), but, as he tilts, his hind-legs leave the ground. Still he keeps gnawing; out steal two small aggressive hands and Brown Mouse has the nut.

Red Mouse is plainly mystified. He hears faint rasps and scratchings. They sound from underneath him. Where has that Brown Mouse got to? Where is that nut? But presently he topples to one side and Brown Mouse starts off running. Red Mouse pursues, the nut is dropped, and Red Mouse comes once more into his own.

The pair of them have almost reached your feet. But for the failing light, you might see more. You slowly stretch yourself and rise. You saw the last three leaps of them—leaps a foot long, two hundred to the minute, for frightened Field Mice bound like kangaroos.

This leaping power is notable. In France it gives a pretty name to them—*Rats sauterelles*, Grasshopper Mice.

The Field Mouse can manage a standing jump of two feet upwards, and I have known one leap boldly downwards from a first-floor window, land on a flower-bed, and proceed unhurt.

DOUGLAS ENGLISH.

HOW TO KNOW THE WILD FLOWERS

By the REV. H. PUREFOY FITZGERALD, F.L.S.

With Photographs by HENRY IRVING

THE FLOWERS OF THE WAYSIDE—II

THE COLTSFOOT

THE Coltsfoot (*Tussilago farfara*) is a representative of a large family of plants, the *Compositæ*. These herbs, in the great struggle for existence, have found it best to amalgamate and co-operate. Each flower really consists of many florets collected together into a single head; the calyx of these Compound flowers is called an involucre. Examine the yellow flower of the Coltsfoot and you will see that the florets are of two kinds, the outer ones, forming the ray, are more or less strap-shaped, and are all female; that is to say, they have pistils, but no stamens. The inner florets, composing the disc, are smaller and tubular in shape, and produce honey and pollen. The Coltsfoot is very common on waste ground, and rejoices especially in a moist clay soil, its presence generally indicating stiff, poor ground. The flowers appear before the leaves, about the end of February or the beginning of March, each stem rising straight from the ground and bearing a single head of florets; when the flowers wither the head

becomes pendent (as may be seen in the photograph), probably to protect the young seed from the wet; as the fruit ripens, the head once more becomes erect, and the dandelion-like seed is blown away by the wind. The leaves appear afterwards and are large and curiously angular in shape; beneath, they are covered with a thick, woolly down. Pliny mentions that the dried leaves and roots were smoked through reeds, the smoke being swallowed as a remedy for a cough—whence the name *Tussilago* (*tussis*, a cough).

THE DAISY

The Daisy (*Bellis perennis*) is another representative of the Compound flowers; it is to be found blossoming more or less throughout the year. This plant is too well known to need any introduction; by some writers the name is said to come from the "day's eye," from its habit of opening at sunrise and closing at sunset. In Scotland it is frequently the "bairnwort," from its being especially beloved by children; "gowan" is also another name by which it is known in the north.

The chief advantages in the arrangement of the Composite flowers are: firstly, that the flowers in being grouped together are more conspicuous than they otherwise would be; secondly, that insects are more readily attracted to them because of the facility afforded of collecting the honey; and thirdly, that the visits of insects are more likely to ensure the transference of pollen from the many small male flowers to the stigmas of the other florets, and so secure fertilisation.

COLTSFOOT.

THE MALLOW

Three different kinds of Mallows are commonly to be met with by the roadside, flowering throughout the summer. The most striking of these is the Musk Mallow (*Malva moschata*), the flowers being of a bright rose-colour, crowded together at the top of the stems and branches. The five wedge-shaped petals will be seen to be jagged at the ends, and there are three small leaves, called bracts, below the five-toothed sepals; in the bud the petals are curiously twisted. The lower leaves are more or less round, whilst those on the stem are deeply divided. In the Common Mallow (*M. sylvestris*) the flowers are of a reddish purple colour, and are produced in clusters springing

PLANT LIFE

THE FRUIT

Specimens required :—Seeds of Poppy, Wallflower, Pea, Bean, Broom, Blackberry, Columbine, Hazel, Buttercup, Wild Geranium, Currant, and Cherry

Structure

Examine these seeds and seed cases. Note the function of seed cases.

Classification

Divide the fruits into two groups—*viz.* :—

- Group A.—Fruits with succulent (juicy) seed cases—*e.g.* Blackberry.
- Group B.—Fruits with dry seed cases—*e.g.* Pea.

Group A—viz. Blackberry, Currant, Cherry. *Note :*—

(*a*) Cherry.—One seed in case, drupe.
(*b*) Blackberry.—A collection of drupes.
(*c*) Currant.—A berry.

Group B—viz. Poppy, Wallflower, Pea, Bean, Broom, Buttercup, Columbine, Hazel.

Divide Group B into two smaller groups :—

Group I.—Containing seed cases which open when seeds ripen—*e.g.* Pea, Bean, Broom.

Group II.—Containing seed cases which do not open—*e.g.* Hazel, Buttercup, Geranium.

Examine each. *Note :*—

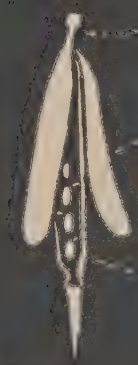
Group B
- *Group I.*—(*a*) Pea.—Seeds in one vessel.
  (*b*) Wallflower.—Seeds in two vessels.
  (*c*) Poppy.—Seeds in many vessels.
- *Group II.* (*a*) Buttercup.—One seed in each vessel.
  (*b*) Wild Geranium.—Many seeds in each vessel.

Collect other examples and classify according to their structures.

PLANT LIFE — THE FRUIT

Capsule of Poppy

Capsule of Autumn Crocus
3 carpels



Silique of Wallflower

Drupe of
Raspberry

Winged seed
of elm

Winged seed
of Pine

Winged seed of
Sycamore

Pappus of
Thistle

Types of seed & seed cases

MUSK MALLOW.

ROUGH CHERVIL.

from the base of the leaves; the dark veins on the petals are very conspicuous. The Dwarf Mallow (*M. rotundifolia*) is a much smaller plant, with bluish flowers; it may be distinguished from the other two by its more trailing habit. The flat, green fruits of the Mallows are sought after by children, who call them "cheeses."

THE DAISY.

THE CHERVIL

The Chervils introduce a large family, the members of which are somewhat puzzling and difficult to distinguish from each other. All the *Umbelliferæ* have their flowers arranged on short stems, which spring from the same point, like the iron stays of an umbrella. The Rough Chervil (*Chaerophyllum temulum*) is a common wayside plant, with pretty, divided foliage; the outer petals are larger than the rest, and this will serve as a distinguishing feature. The stem is slightly thickened at the joints, and is curiously blotched with purple. The arrangement of this kind of inflorescence must be of considerable advantage, since any visiting insect generally spends some little time on each head, gathering honey from the many flowers, and transferring pollen from one to the other as it goes.

The Rough Chervil grows about three feet high, and is to be found by waysides and in the hedges, flowering during June and July.

H. Purefoy FitzGerald.

HOW TO KNOW THE BIRDS

By the REV. MAURICE C. H. BIRD, M.A., M.B.O.U.

With Photographs by
RICHARD AND CHERRY KEARTON

THE THRUSHES

IN the locality where I am writing almost everybody knows the Song Thrush from the Missel Thrush, though the former is generally called a Mavish and the latter a Fulfer; but although we have a regular visitation of Redwings and Fieldfares, wintering with us more or less abundantly year by year, their differences are practically undiscovered by many people, who jumble the two species together as "French Mavishes," whilst some confound the Fieldfare with the Missel Thrush and the Redwing with the Song Thrush. In point of size the Missel Thrush is the largest of the four; on the ground or in flight it at once strikes one as being a more strongly built and more lumpy bird than the Fieldfare, which is, perhaps, an inch shorter. The Redwing is the smallest of the four — about 8 inches in length. Not that measurements alone can be trusted for the identification of any bird, as, for example, in December, 1904, I handled a Song Thrush in full feather which only extended to 6¼ inches.

In *plumage*, Missel Thrush, Mavish, and Redwing are much alike, the distinguishing marks being as follows. The Missel Thrush alone has a white patch at the base of the inner web of the two outer tail feathers on either side, these being conspicuous in flight. It may also be known from both the Song Thrush and

MISSEL THRUSH AND NEST.

Redwing by its axillary or armpit feathers, which are white; whilst in the Song Thrush they are buffish yellow, and in the

BLACKBIRD'S NEST AND EGGS.

Redwing, as its name implies, they are a decided chestnut-red. Redwing and Song Thrush may also be known apart, in that the former has a well-defined whitish stripe over the eye, extending from the beak nearly to the nape. There are dark spots on the throat and breast of all four species, but they are largest and most conspicuous in the Missel Thrush, their surrounding ground colouring being also lighter than in either of the other three birds. The entire upper plumage of the Fieldfare is strikingly different from the uniform sombre olive-brown of Mavish, Redwing, or Missel Thrush, although it has the white armpit of the latter. His head and rump are slate-grey; wings and tail are conspicuously dark; throat rich brown, streaked rather than spotted with black; and the belly is white; the latter being clearly seen in flight. In some seasons Fieldfares stay with us as late as the first week in May, by which time the beaks of the males have become brightly suffused with yellow. Neither the Fieldfare nor Redwing remains to breed or sing in England, and so their call or alarm notes alone can assist us in distinguishing them by ear, the noisy "chack-chack" of the former being more frequently heard than the softer and subdued "se-you" of the latter. Both of these birds are more or less gregarious, feeding, flying, and roosting in small parties. It is a habit of the wily Fieldfares, whilst resting on tree or fence, for all members of the assembly to face one way, ready to take wing at once should their sentinel give the alarm note. Curiously enough, both these winter visitors from more northern climes succumb to frost and snow sooner than Song or Missel Thrush, being probably less omnivorous and more chary

SONG THRUSH'S NEST AND EGGS.

of approaching the habitations of man, even when hunger presses.

The song of Mavish and Missel Thrush may sometimes be difficult of identification.

Both are very early songsters; but, as its common name proclaims, the former possesses the more musical, if not the louder notes. He is also the most constant singer throughout the year. Reference to my note-books remind me that since 1875 I have chronicled his tuning up in every one of the twelve months—though not the same bird, or in the same year, of course; for seasons differ, and during the moulting time all song birds are silent.

Missel Thrushes cease singing after their last broods are reared, when they leave their nesting sites and become more or less gregarious, pairing and challenging one another again in song with the new year. The nickname of "Stormcock" has been won by the loud persistence of the Missel Thrush in defying wind and rain, whilst pouring forth from the top-

MISSEL THRUSH AND NEST.

FEMALE SONG THRUSH AT NEST WITH YOUNG.

most spray of tallest tree its loud, short, oft-repeated strains. Only the mild days throughout the winter tempt the Mavish into sweeter song—sent forth from lowlier perch: song immortalised by Tennyson, and reduced to words by many lesser bards before and since: song which varies greatly, not only according to the listener's sense of sound, but also according to the singer's surroundings. For the Thrush is a good mimic, and can vocabulate the typical notes of very distant relatives, one—presumably the same bird—here copying correctly for several seasons the Marshland Redshank.

In flight, beyond the conspicuous dif-

ference observable in plumage between the Fieldfare and the Missel Thrush, Redwing, and Song Thrush, and the fact that

YOUNG MISSEL THRUSHES.

the two former are generally seen in companies and the latter two alone, the altitude at which the Fieldfare and Redwing fly is usually greater than that indulged in by the Song and Missel Thrush. Its strong and undulating method of moving through the air from place to place is distinctive of the bold "Stormcock."

In nesting habits, Song and Missel Thrush are so far similar, in that both commence to build early in the year. Both make large and conspicuous nests frequently in the vicinity of houses; but there the resemblance stops, for though the outside materials used in either case may be somewhat similar, the Song Thrush lines her lighter nest with a practically air-tight plaster of mud or cowdung and rotten wood, and thereupon deposits her black-dotted sky-blue eggs. The Missel Thrush may utilise some such daubing sparingly ere her cradle is half constructed, but she proceeds to finish off with an abundance of fine dry—sometimes only half-dead—grass, raising a more solid structure with not so deep a cup as the Mavish delights to brood in. The necessity of these differences—bar the mud-lining, perhaps—may be found in that the Missel Thrush frequently builds in the large crotches of tall and leafless trees, whilst the Song Thrush chooses generally less exposed situations, amongst more slender branches, which demand a lighter and deeper nest.

The better concealment afforded by the site usually selected by the latter bird—frequently amongst evergreens—precludes the necessity of any such attempt at protective coloration, of egg-shell or nest exterior, as is indulged in by the Missel Thrush, whose eggs are of a much more subdued shade both as to ground colour and markings; and she also resorts to the artifice of weaving in and around her nest pieces of grey-hued lichen, which is parasitic upon the surrounding branches. There are exceptions to every rule, and so it is not surprising sometimes to find the nest of this otherwise wary bird, not

YOUNG SONG THRUSHES.

only placed within a few feet of the ground, but also advertised in its whereabouts to every passer-by in consequence of its external adornment of a piece of white paper, calico, lace, or coloured dress material. Only three or four years ago I insured the safety of a family by removing one such impediment from a nest built within five feet of the ground and within double the distance of our carriage drive. One last point of distinction between the nestlings of Song and Missel Thrush: the down, or filo plumes, of the latter are retained for a longer time, and are lighter in colour.

Though the young of the Blackbird are distinctly spotted, and in their first plumage of somewhat lighter ground colour than the adult female, they are not likely, in either sex, or at any age, to be mistaken for those of any other British bird, unless it be the Ring Ouzel, a much rarer bird as to its general distribution. It breeds only in mountainous or moorland districts, and occurs but sparingly elsewhere as a passing spring and autumn migrant. At the latter season it is especially partial to elderberries and, as I once noticed, to black currants. As to plumage differences, the possession of a white, crescent-shaped gorget, or throat-band, will generally serve to distinguish Ring Ouzel from Blackbird. The difference in size between the two species is too small to be serviceable; but, at fairly close quarters, the greyish-white edging to the feathering of the former gives it a distinctively dull appearance compared with the glossy jet-black jacket of the adult male Blackbird, and it also lacks the set-off of the proverbial "orange tawny bill" of the ubiquitous Blackbird, the champion, to my mind, of all British songsters. The barred, or spotted, plumage of the young of both species shows, as the similarity of size and shape suggests, their relationship to the Thrushes.

BLACKBIRDS AT NEST.

In the two lower pictures the male bird is shown feeding the nestlings.

With regard to habits, the regularly practised flirting of the tail immediately after alighting—which, when the evening light begins to fail, serves to distinguish the Blackbird (a very late feeder) from the other Thrushes—will not assist us in recognising him from the Ring Ouzel, which also indulges in the same conceit. As to habitat,

as a general rule the one frequents cultivated, and the other unenclosed, land; whilst the Dipper, or Water Ouzel—also a bird of restricted range, and only occurring regularly in the neighbourhood of mountain torrents or rapidly-running streams—may just be mentioned because its name suggests a possible mistake being made between it and the Ring Ouzel. Moreover, it also is a black bird, and has in both sexes a white throatlash similar to the Ring Ouzel; but its aquatic proclivities and stumpy wren-like tail should be sufficient to prevent any likelihood of mistaken identity. The nest of the Dipper is also Wren-like. Its eggs are pure white; its song in no wise resembles that of its upland relative; its whole economy, in fact, is entirely different from that of the Ring Ouzel.

MALE BLACKBIRD.

M. C. H. Bird.

JUNE IN THE AUSTRIAN TYROL.

From the Painting by J. MacWhirter, R.A., in the National Gallery of British Art.

HOW TO KNOW THE CLOUDS

By WILLIAM J. S. LOCKYER, M.A., Ph.D., F.R.A.S.

With Photographs by the Author

II

COMING now to the clouds which in the classification fall in the intermediate layer, the highest of these is the *cirro-cumulus*. These can easily be identified, as they are composed of small globular masses or white flakes without shadows, or with very light shadows, and they arrange themselves in groups, and very often in lines. Sometimes they appear like waves on the surface of water, and occasionally two distinct systems are observed, the regular striæ apparently crossing each other. This type of cloud is perhaps better known as "mackerel sky," as the flecks have a thin scaly appearance, like unto scales of certain fish.

CIRRO-CUMULUS CLOUDS.
Photographed at South Kensington, July 13, 1907, at 10.50 a.m.

The example of cirro-cumulus shown on page 65 is from a photograph taken at South Kensington on July 13th, 1907, at 10.50 a.m. Here we see the globular masses covering the north-eastern part of the sky, and with some tendency to form into lines.

The next type of cloud in order of descent is the *alto-cumulus*, moderately large globular masses, white or greyish, partially shaded, arranged in groups or lines as the cirro-cumulus, and often so closely packed together that their edges become confused. A good instance of this type is shown in the next two illustrations, which illustrate a most interesting transformation of cloud form, both specimens of which come under the alto-cumulus heading. The photographs were taken at South Kensington on May 10th, 1907, with an interval of forty-two minutes between them, and the camera was pointed in practically the same direction—namely, north-east—for both exposures.

In the photograph on this page it will be seen that the clouds at this time—

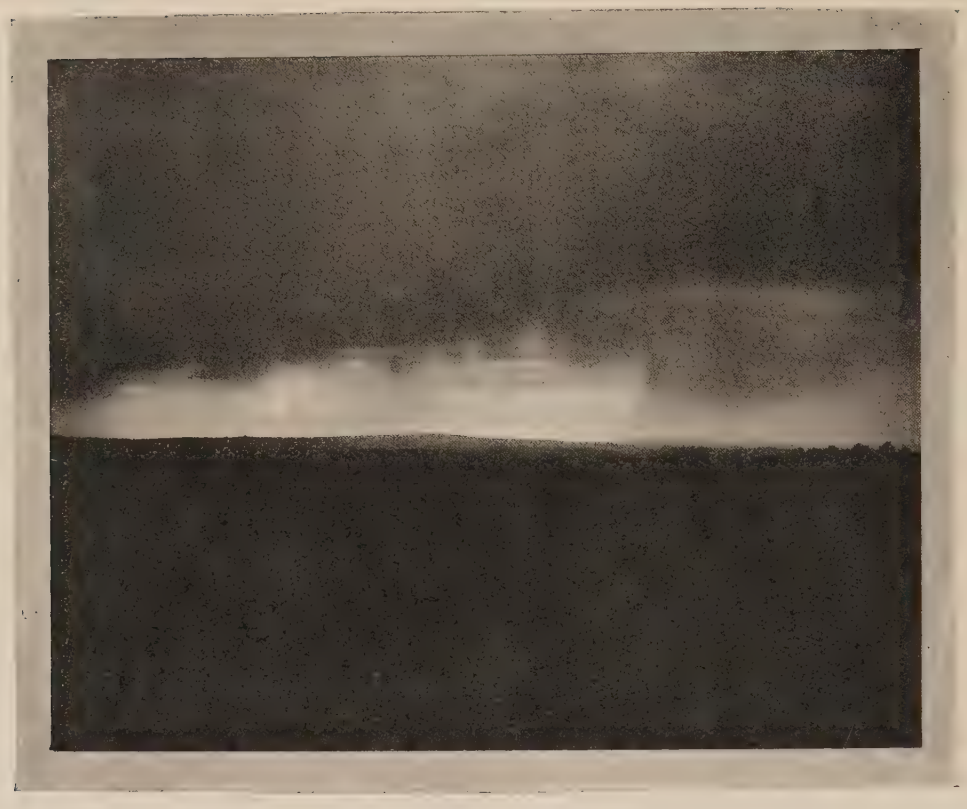
ALTO-CUMULUS CLOUDS.
Photographed at South Kensington, May 10, 1907, at 11.33 a.m.

11.33 a.m.—formed themselves in parallel lines, the globular masses in each line being practically welded together. This condition of things was the same all over the sky in that quarter of the heavens. At 12.15 the whole of this series of lines had broken up into separate masses, as will be observed in the succeeding illustration. It will be noticed that the lines are still fairly maintained, only their direction is not quite the same as that indicated in the previous illustration.

The form of cloud which must be described next—namely, the *alto-stratus*—is not here illustrated, as not only is it uninteresting from the photographic point of view, but its description defines it

ALTO-CUMULUS CLOUDS.
Photograph taken forty-two minutes after that on p. 66

STRATO-CUMULUS CLOUDS.
Photographed at Tunbridge Wells, Dec. 25, 1906. at 11 a m.



NIMBUS CLOUD.
Photographed at Tunbridge Wells, May 18, 1907, at 11.33 a.m.

better than any photograph would do. It consists simply of a thick sheet of a grey or bluish colour, and in the neighbourhood of the sun or moon shows a brilliant patch. Unlike cirro-stratus, it does not give rise to halos, but sometimes causes coronæ (bright rings, closely surrounding the sun or moon). Measurements have shown that this type of cloud is only half as high as the cirro-stratus type.

Passing now to the lower clouds, we come to the *strato-cumulus*, a cloud which is too irregular to be called stratus and not sufficiently lumpy to be called a cumulus. This type signifies large, globular masses or rolls of dark cloud, which frequently cover the whole sky, especially in winter, and sometimes presents a wavy appearance. The masses are not dense, and between them blue sky is often seen. In fact, we have here a type of cloud which is very much like the alto-cumulus, only situated at a much lower level, and consequently the cloud masses appear on a rather larger scale. The lower illustration on page 67 will serve to illustrate this type. The original photograph was taken at Tunbridge Wells, on December 25th, 1906, at 11 o'clock. The brightest part of the picture in the lower portion indicates the neighbourhood of the winter sun, which was obscured most of the morning by this and by alto-cumulus form of cloud.

We now come to the *nimbus*, or rain cloud. This type is composed of a thick layer of dark clouds without any definite shape, and with ragged edges, from which rain or snow generally falls. Its approach is usually accompanied by a great diminution in daylight, and in consequence is not an easy object for the camera. Underneath the layer of nimbus there are, as a rule, small loose clouds which may have become detached from the main

cloud, and which float at a great speed at a lower level. This has been termed *fracto-nimbus*, or broken nimbus, and is the equivalent to the word "scud" commonly used by sailors.

The illustration on page 68 shows a nimbus giving a copious rainfall, some distance away from the camera, after it had just passed over Tunbridge Wells. This photograph was taken on May 18th, 1907, at 11.33 a.m. The rain, it will be seen, was coming down in bucketfuls, and it is interesting to note the different angles at which it is falling under different parts of the cloud. This was, no doubt, due to the varying air currents which so commonly accompany such rain-storms.

WILLIAM J. S. LOCKYER.

HOW TO KNOW THE INSECTS

By JOHN J. WARD, F.E.S.

Author of "Some Nature Biographies," "Peeps into Nature's Ways," etc.

Illustrated from Original Photographs by the Author

SPRING'S TRANSFORMATIONS

MANY of those insects which become conspicuous on almost the first day that provides bright sunshine and a mild temperature, and so herald spring, disappear from view towards the end of May. The amateur Nature student often fails to observe how suddenly and completely they vanish, because so many new insects are continually appearing to occupy his attention. Later on, however, he realises that a certain butterfly, moth, or caterpillar which was previously very abundant, is no longer to be found, and it becomes obvious to him that insects have their seasons; he also learns that some of these seasons are very brief.

There is, for example, the Brimstone Butterfly, which I introduced in my first paper. My earliest recorded day (for the Midland counties) when that species was really flying is March 16th. On that occasion I saw four butterflies together. It is true that a single example may be seen on any day during winter, for, as I have previously stated, these butterflies live through the winter. Until the end of May, in the Southern and Midland counties, the butterflies are familiar objects on every sunny day; their brimstone and pale yellow wings are continually seen fluttering along by the hedgerows and skirting the woods. Then, almost suddenly, they cease to appear, and we forget all about them until some day early in July; Brimstone Butterflies are then in evidence again, and the amateur entomologist is sorely puzzled to account for their disappearance during the prior seven or eight weeks.

Such incidents are of frequent occurrence in the life-histories of many species, and those who desire to know the insects should always endeavour to discover what happens during the interval when they are not visible. A little time spent in such investigations will do more towards the making of a Nature student than whole weeks spent with net in hand capturing butterflies, and other insects, and carefully naming them. The latter work may eventually produce a well-arranged insect cabinet, and its owner may become a veritable human entomological catalogue, able to label an insect at a glance, and to spell out its scientific name with marvellous ease, but, nevertheless, it does nothing towards revealing the curious and interesting habits of insects; it does not explain how marvel-

lously their life schemes are harmonised with the seasons and the particular food and conditions they will need; indeed, the dry-as-dust collector knows scarcely anything of these things, his chief knowledge consisting of dates and districts when and where the insects may be found.

Let me, therefore, warn the would-be Nature student not to be too anxious to collect. He will be able to do this, if he so desires, later on, when he has learnt something of the ways and habits of the insects, and much more efficiently then, since his observations will have guided him and given him method in his work. How then must the amateur begin? For answer let us consider the case of the Brimstone Butterfly.

CATERPILLARS OF BRIMSTONE BUTTERFLY.

In early May we observed that the butterflies were love-making, and after the mating attention is given to family matters, which, in the case of insects, usually means merely the depositing of eggs in suitable situations for the independent development of the offspring. When digging in the garden early in the year we may come upon an instance of exceptional care for the young of insects. I refer to the common Earwig, which maternally sits upon her batch of forty or fifty eggs until they are hatched, and even thereafter guards and protects her young. The Brimstone Butterfly, however, rarely lives to see her offspring, although her eggs hatch into caterpillars in some eight or nine days after they are laid, and even if she should live it is improbable that she would ever recognise them. All interest in her offspring ceases as soon as she has deposited the last of her eggs; by that time, too, her strength is so completely exhausted that, it may be, she has but a few hours to live.

Since this butterfly deposits her eggs only on the two British species of buckthorn shrubs, they are easy to find. They are usually placed on the veins of the under sides of the leaves. I need not introduce a picture of the egg, because it is almost of the same form as that of the Orange-Tip Butterfly shown in my previous article (p. 47), being only a little more elongated. So when the pale yellow butterfly is seen fluttering about amongst the leaves of buckthorn shrubs, there is the first observation to record.

Eight or nine days after her visit some little caterpillars emerge from the eggs which she has so diligently placed amongst the leaves. About four weeks later you may go and shake them from the trees, for they are then full-grown. In the illustration on this page the caterpillars are shown feeding; they are coloured pale green with a white stripe along each side of their bodies. This, then, is the reason why early in June Brimstone Butterflies are not to be seen; only an occasional belated example, or a very early one of the next generation,

is then to be met with. The parent butterflies that lived through the winter have ceased to exist, and those butterflies that will suddenly appear about the beginning of July, are, as we have seen, feeding on the buckthorn leaves. Later on, we shall doubtless discover the connecting links between these hungry caterpillars and the yellow winged butterflies.

COCOON OF DRINKER MOTH CATERPILLAR.

At the beginning of the month, too, we glanced at the caterpillars of the Drinker Moth. Where are they now? Well, the cuckoo, that calls from the distance, could probably account for many of their number, for that bird is one of the caterpillar's most persistent enemies. A search amongst the coarse grasses on which these caterpillars fed will probably reveal some spindle-shaped objects attached to their stems (as shown in the photograph on this page), and safely wrapped in these are the fortunate larvæ that escaped the cuckoo.

By this time, however, the caterpillar has most probably changed into a chrysalis, lying within the strong cocoon it has constructed from self-spun silk, interwoven with tufts of the white and brown hairs that decorated its body. So it will rest for some four or five weeks—when we must look for it in its new guise.

Other quaint bundles may be seen suspended by silken threads from elder twigs. These are very differently constructed, they are composed of small pieces of leaves fastened together by means of silken threads. If we pull the bits of leaves apart, in the centre of each of these cocoons we shall find a dark-coloured chrysalis together with a shrunken caterpillar skin. The skin is shrunken so much that even if it be straightened out it will probably give but little clue as to what its late owner was like. It happens, though, that I saw the cocoons shown in the illustration, when in the process of construction, so that I am able to say just how they came to be, and the story is simply this: Two most curious and interesting caterpillars held to the branches very firmly by their tail claspers while they stretched out to reach the leaves, from which they bit pieces. Each caterpillar first gathered two pieces and suspended them to the

COCOONS SUSPENDED FROM ELDER TWIGS.

A CATERPILLAR PREPARING FOR ITS METAMORPHOSIS.

branch by silken cords that it spun for the purpose. Then, working independently, each larva joined its two bits of leaves together by means of other threads, the bits of leaves then forming a kind of ring. After this foundation was laid matters were comparatively simple, the caterpillars continually adding other bits of leaves until they had sufficient to cover their bodies. Eventually they let go their hold with their tail claspers and dropped into their leafy hammocks, which now hung suspended on the silken cords that held the two first-gathered bits of leaves to the branches. After about forty-eight hours from the commencement of the work, the caterpillars had sealed up the inside and disappeared from view, leaving things as shown in the illustration (p. 71). A peep into one of the cocoons a few days later revealed a pupa, or chrysalis; for the developing insect had changed its form simply by moulting its skin. And there the story ends, except that I have not yet stated what species of caterpillars these were. That will be quite unnecessary, however, as I have already introduced my readers to the two identical caterpillars that constructed these leafy cocoons. I refer to those two fraudulent individuals shown on page 50 of my previous article.

THE CHRYSALIS.

The various metamorphoses through which insects pass is certainly one of the most fascinating features of study in the lives of these little animals. In woods of the southern counties another curious transformation scene may be witnessed at this season. From beneath a branch, or leaf stalk, a curious spiny caterpillar may sometimes be found suspended by its tail, in the manner shown in the photograph on this page. If such a caterpillar is again noticed two or three days later it appears as in the next illustration. There, a chrysalis appears instead of a caterpillar. The caterpillar, it should be observed, is holding itself in a curved position which tightens up the skin at the back of its head. Eventually the strain causes the skin to burst at that part, after which the skin shrinks slowly towards the caterpillar's tail-end, attached to the stem; finally the old skin falls

LIME HAWK-MOTH.

1 2 3 4 5

DEVELOPMENT OF THE PALE TUSSOCK MOTH.

to the ground and leaves the chrysalis hanging. Thus we have an instance of a chrysalis being produced without a cocoon to protect it, for here we have a butterfly developing and not a moth. Some species of moth caterpillars, however, also become chrysalides without constructing cocoons, but these generally hide amongst fallen leaves, or are buried in the soil. The butterfly that appears from this chrysalis I hope to introduce in my next article.

In the illustration on page 72 we have an example of an insect that has completed its development. This is the Lime Hawk-Moth (*Smerinthus tiliæ*), which in early June will sometimes be found resting as shown in the photograph. It is a charming insect. Its rich, grey browns, contrasted with patches of bright olive green, together with its irregularly-cut wings, simulate its surroundings so well that amongst the leaves and branches its harmony with its environment is perfect; the eye may glance over it several times before it is realised that it is a large moth that is looked upon. Even in the photograph—although the insect is there shown right in the foreground backed by the bare branch—it does not force itself upon the eye as a moth. Much of this subtle effect is doubtless due to its irregular blotches of colour. It is interesting to note also, that the individual moths vary immensely, so that their enemies have little opportunity to accustom their eyes to its scheme of colour; and probably to them the moth is even much less conspicuous than it is to us.

When gazing on the lovely wings of the Lime Hawk-Moth as it rests, it seems scarcely credible that, only an hour before, the moth was buried a foot deep in the earth; yet such was the case. From September, throughout winter until June, it has been entombed, not as a moth, but as a chrysalis formed from the caterpillar that buried itself in the soil. Now it has crawled through the coarse earth to the surface, climbed the tree, and developed its wings. When it reached the branch it had no wings, at least nothing more than dumpy apologies for such. At the end of an hour, however, its organs of flight were fully developed. How they developed I will show by considering another example of a familiar moth; for all moths on leaving the chrysalis develop their wings in practically the same manner.

Look at the long-bodied, short-winged insect shown in the first illustration on page 73, and then see it again in the second photograph. In the latter the moth is seen commencing to extend its wings. Ten minutes later they appear as shown in the third photograph, having elongated more than twice the length shown in the first. In the fourth illustration they are shown some five minutes later when fully developed and drying. In my first article I pointed out that moths rest with the upper sides of their wings exposed. This moth, it will be noticed, is resting while showing the lower sides of its wings, for at present the wings are wet and therefore are not under muscular control. Later on they dry and become rigid, and then the moth suddenly reverses them into the positions they naturally assume when the moth is resting as shown in the final photograph. Both moths and butterflies select the under sides of branches and leaves on which to develop their wings, so that they can fall from their folds and hang in space while they dry and complete their development. Thus we have produced the common Pale Tussock Moth (*Dasychira pudibunda*). This moth, previous to the development of its wings, crawled from the ground amongst the dead leaves, leaving behind its cocoon constructed from the quaint tufts of hairs that clothed its body when a caterpillar and protected from view by lightly attached leaves. This cocoon the caterpillar had formed the previous autumn, and, in due course, it fell to the ground with the leaves at the time of their "fall."

From the foregoing examples it is clear that insect life does not begin in the spring and terminate as winter approaches. With a little knowledge of the habits of insects, the Nature student may study insect life at any time during the year. It is obvious, also, that a few life-histories completely investigated will lay the foundation of much future knowledge.

JOHN J. WARD.

HOW TO KNOW THE BIRDS

By the REV. MAURICE C. H. BIRD, M.A., M.B.O.U.

With Photographs by
RICHARD AND CHERRY KEARTON

THE WARBLERS

NEXT to the Thrushes we come to the Warblers, a large group of small and delicately shaped birds, most of which are migratory, although their flight is apparently feeble. As their name would lead us to expect, amongst them are to be found our most delicious songsters. Their life's work seems to be that of keeping in subjection the countless forms of small insect-life, which, if unrestrained, would destroy the vegetation of our fields and groves.

With the two exceptions of the ubiquitous Robin Redbreast and familiar Hedge Sparrow, all are shy and unobtrusive. The nickname of "Shuffle-wings" lends a ready aid to the identification of the latter, for it cannot be watched for many moments together without betraying its identity by restlessly attempting to open its wings, only as rapidly to close them again. It is no near relative to the House or Tree Sparrow — which belong to the hard, cone-shaped beaked birds— whereas all the Warblers have slender bills.

The word "sparrow" means "chirper," and so our homely drab-clad little "Shuffle-wings" gained its names of

HEDGE SPARROW ON HER NEST.

Hedge Sparrow, Hedge Accentor, or Hedge Chirper, from its habit of giving forth its subdued song conspicuously from wayside fences in early spring ere foliage gives concealment to it, its nest, or turquoise-tinted eggs.

As the House Sparrow "chirping on the wall foretells rain coming soon," so the Hedge Sparrow is also included in the list of avian weather prophets from its habit of frequently uttering its short and plaintive call-note "speek, speek" (hence the epithet "Hedge Spike") in damp weather. Its dark blue-grey throat is its only attempt at personal adornment. Though chiefly insectivorous, I find the Hedge Sparrow often takes toll of wheat when I am feeding my poultry with small corn, whereas when their diet is changed to maize, Blue Tits soon discover the difference, and carry off grains of the Indian corn, to pick out the soft base, and drop the remainder.

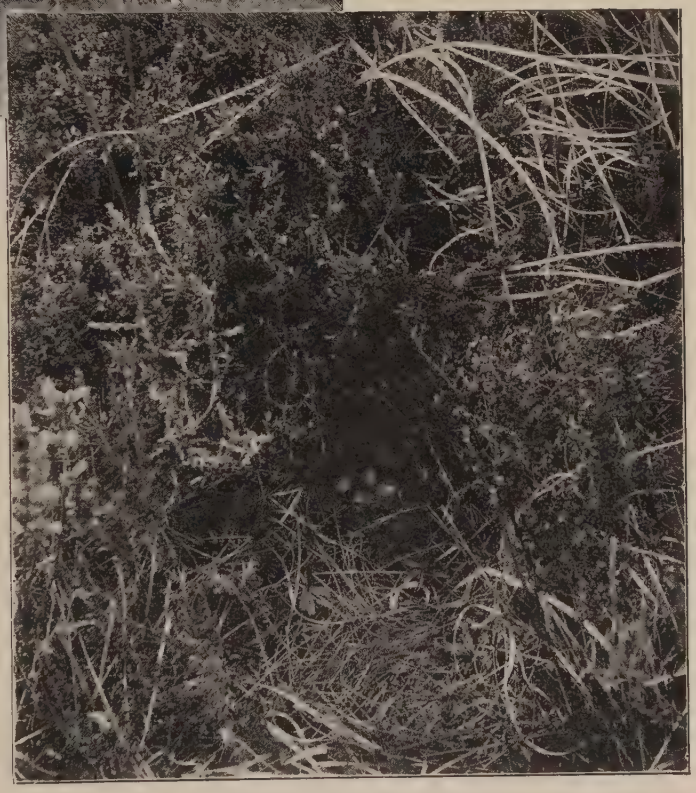
These last remarks may not seem to have much connection with bird identification, but it is always helpful to know what species we may expect to meet with at certain times and places, and how they are likely to behave whilst they are knowingly or unwittingly under our observation. Thus, when we are calling our domestic fowls to feed, the accustomed whistle or "cur chick" is likely to attract various small wild birds, especially in the winter time; in hard weather I have even had Rooks and Grey Crows thus wait upon me. House Sparrows are sure to put in an appearance, and perhaps

THE WHEATEAR.

STONECHAT'S NEST AND EGGS.

a few Tree Sparrows, a Chaffinch and a Greenfinch or two. Not one of the last three will ever venture to approach within some few yards of you, and the crafty House Sparrow is not nearly so daring as the bold Blue Tit, which will dash down from a neighbouring perch to seize and carry off a grain of corn from within a few feet of your toes; whilst the confiding little Hedge Sparrow, even less suspicious of harm than a Robin, will unconcernedly hop around at close quarters, so long as you stand perfectly still—an indispensable qualification for successful bird watching.

Wheatear, Whinchat, and Stonechat are sometimes confused; all three are migrants, though a few of the latter remain throughout the winter. The Wheatear, decidedly the largest of the three, is the most likely to be found on cultivated land, not that its name has any reference to agriculture, but is supposed to be derived from two Saxon words for its distinguishing mark, a white rump, which is very conspicuous in flight. It is a restless bird, ever on



WHINCHAT'S NEST AND EGGS.

MALE REDSTART.

the move, and when flitting from one bush, stone or clod to another, the white base of its tail and back are easily observable, showing up in bright contrast to the black flight feathers in the wing and at the end of the tail.

The Stonechat's tail is whole-coloured, dark brown, though there is a dash of white where tail and body unite; the Whinchat has the base of the tail feathers white, partly concealed from view in flight by the brown tail coverts. It has two white bars on the wing coverts, the Stonechat one, and the Wheatear none.

The whole upper plumage of the Wheatear is pale bluish grey, in the Whinchat it is brown tinged with rusty red, especially on throat and breast, and there is an almost white stripe over the eye. The Stonechat is more brightly and patchily clad, with black head and throat, chestnut-coloured breast, and the sides of the neck, as well as the wings, splashed with white.

The call note of all three is a somewhat similar "chack"—hence their family name of "Chats." All three are frequenters of the open country, the Wheatear delighting in sandy heaths and warrens, especially near the coast; the Whinchat, as its name implies, may be looked for where Whin or furze abounds, but it also occurs in heath and grassy districts; whilst the Stonechat is seldom found residing except where poor soil encourages furze to flourish.

A YOUNG REED WARBLER

Movements of the tail are characteristic of each of these restless birds. The Wheatear, more a bird of the ground than the other two, takes short runs, moving rapidly, stopping suddenly, and flirting its tail meanwhile. The Whinchat and Stonechat both love to perch on the topmost twig of any bush that they frequent, and both are equally fidgety, not merely in the twitching of their tails, but in moving from one coign of vantage to another, sometimes taking insects in the air after the manner of the Flycatcher.

All three are early breeders, especially the Stonechat, and the nests of both it and the Whinchat are very difficult to find because so generally well concealed and protected, either on or very near the ground, beneath the prickly gorse bushes. The Wheatear actually goes to ground for breeding purposes, selecting when possible the mouth of a disused rabbit's burrow for depositing its dull pale blue eggs, the shells of which are of rougher texture and less frequently tinged with indistinct patches of reddish brown towards the larger end, than is the case with the smaller and more elongated and slightly darker shaded eggs of Whin- and Stonechat.

The male Redstart might be mistaken for the male Stonechat, in that both are red and black and white, but the respective colours are differently placed, and the haunts and habits of the two birds are distinct. The Redstart's distinctive mark is hidden in its name—for "start" means tail, as the more expressive, but more local, designation "Firetail" brings out. The red tail is common to both sexes, and although the bird itself is no larger than the Stonechat, its tail is longer in proportion. It is a summer visitor and a frequenter of gardens and orchards, and though not common it is widely

distributed and by no means of shy disposition, returning year after year to nest in the same hole in wall or tree.

REED WARBLER'S NEST.

At Beccles Grammar School, in the early seventies, a pair bred for two successive seasons under the inside eaves of a long lean-to lobby through which fifty to sixty boys passed several times a day. Not only is the red tail sure to attract attention, but the white forehead of the male Redstart, prefaced by a black line, contrasts so strongly with the black face and throat, bluish grey head and back, and chestnut breast and rump, that forehead and tail at once distinguish it from all other British birds.

The names of Sedge and Reed Warbler help us somewhat to separate between the two Waterside Warblers, for although the former may be found in the vicinity of ditches, ponds or streams of small pretensions, the latter demands a reed-

bed of some extent, therefore the Sedge-bird is the commoner of the two, and is almost certain to be found wherever the

SEDGE WARBLER.

Reed-bird occurs. Both are little brown birds with rounded tails, but the Sedge Warbler has its upper plumage spotted with darker brown, and the buffish white line over the eye is much more conspicuous than in the Reed Warbler.

The nesting habits of the two species are quite distinct, for while the Sedge Warbler builds a comparatively clumsy nest low down amongst any kind of marsh undergrowth, and even in high and dry situations at some distance from the water—at Cambridge I once found one in a garden gooseberry bush—the more particular Reed Warbler weaves a beautiful deep-cupped cradle, suspended above the water by the aid of three or four reeds. I have now by me four nests, mown out by marsh cutters, in which seven, five, five, and nine reed-stems are thus utilised, and the lining is chiefly composed of the feathery bloom of the former year's reed. Both of these Marsh Chats are incessant singers, and although their notes are somewhat alike, and both can be roused into song by being disturbed after dark, the Reed-bird gives the better music, which is not so harsh nor does it contain so many notes borrowed from other birds as does the chatter of the bolder Sedge Warbler.

The Nightingale, fastidious in its habitat, but surely betraying its whereabouts by its proverbial notes, is far more often heard than seen, for although it does not rest by day, it is a great skulker, and delights in thick undergrowth,

NIGHTINGALE.

especially where oak is the prevailing timber. In fact I never remember having found a nest of this species of which dead oak leaves did not form a part of the outer covering. Perhaps the only bird for

WOOD WARBLER'S NEST AND YOUNG.

BLACKCAP'S NEST AND EGGS.

FEMALE BLACKCAP SITTING ON NEST FULL OF YOUNG.

which a Nightingale might be mistaken is a somewhat large Robin without a red breast and with a slightly elongated and ruddier tail than usual—the make and shape of the champion songsters of winter and summer being similar.

The Blackcap is inferior in song only to the Nightingale. Leave out the distinct and piteous wailings of the latter, and remember that they are chiefly heard during the time when all other birds are silent, whilst the Blackcap competes with the whole chorus of the grove, and we must confess that the Nightingale owes much to the bewitching solitude and twilight for exceeding popularity over the less melancholy voiced Blackcap.

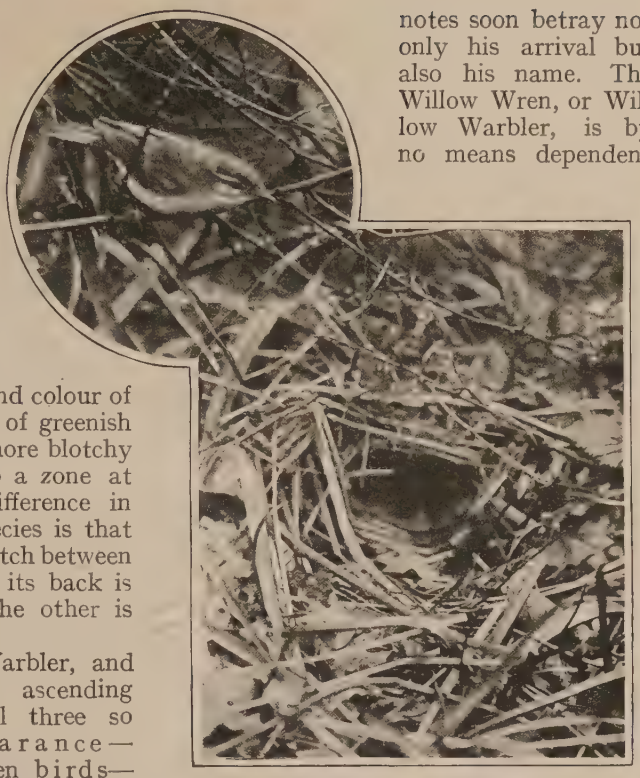
The Garden Warbler, a specially good performer of the species, runs the Blackcap very close in point of melody, so that voice alone is no safe guide to identity. When once the respective songsters can be seen, however—and neither is so retiring as the Nightingale—the black hood of the male of the latter species, and the brown cap of the female, at once identifies them from the more sombre whole-coloured Garden Warbler.

There are yet two other small birds, somewhat similar to the last named, which also might be mistaken for one another, namely the Common and the Lesser Whitethroats. All these Warblers are between five and six inches in length, and the so-called Whitethroats are by no means conspicuous for the whiteness of their bibs, although sufficiently so to distinguish them from the Garden Warbler. The commoner bird of the two Whitethroats is really common everywhere, and in consequence rejoices in several local names; "Hayjack," from its frail dead-grass cradle, being the most frequent, while "Nettle-creeper" declares its partiality for situations where such weeds luxuriate. It is a merry, cheerful bird, not much of a songster, but frequently uttering its excited and erratic warble as it mounts

WHITETHROAT ON NEST.

from the roadside fence to seize a passing insect. With the possible exception of a wild cock Blackbird in winter, no British bird can throw itself more suddenly over a hedge than the male Whitethroat.

The Lesser Whitethroat is more a bird of the shrubberies, and builds its similar nest at a greater altitude than its more frequent relative; its eggs are smaller in proportion, while the ground colour of them is nearly white instead of greenish white, and the markings are more blotchy and more nearly confined to a zone at the larger end. The only difference in plumage between the two species is that the smaller bird has a dark patch between the eye and the beak, and its back is bluish grey, whilst that of the other is reddish brown.



CHIFFCHAFF AND NEST.

The Chiffchaff, Willow Warbler, and Wood Warbler, arranged in ascending scale of magnitude, are all three so similar in appearance—little yellowish-green birds—that it is practically impossible to draw any sufficient distinction between them to enable the novice to identify them apart in life. In song, however, they differ much. The Chiffchaff is about our earliest spring migrant, and his two monotonous notes soon betray not only his arrival but also his name. The Willow Wren, or Willow Warbler, is by no means dependent upon willows either for a living or a lodging, it being the most generally distributed of the three species. Its "weeping" song seems loud for so small a bird. The Wood Wren, or Wood Warbler, is the rarest of the three, and more confined to a wooded country. Although all three seek their food chiefly from arboreal insects, and frequent tall trees in their search, all build their dome-shaped nests either on or very near the ground. The Wood Wren alone declines the use of feathers in the lining. The eggs of each are much alike, and a practised eye alone can differentiate them apart from the nest.

WILLOW WREN.

WILLOW WREN'S NEST.

M. C. H. Bird.

HOW TO KNOW THE WILD ANIMALS

By DOUGLAS ENGLISH, B.A., F.R.P.S.
Author of "Wee Tim'rous Beasties," etc.

THE HARVEST MOUSE

With Photographs by the Author

THE Field Mouse is a handsome, well-bred gallant, the Dormouse a soft, comfy, round-eyed ball; but, for the dainty grace of Dresden china, give me the Harvest Mouse.

It is an unkind fate which makes him, of all our Mice, the least likely to be casually encountered. Not that he is more nocturnal, for he loves the sunshine; not that he is inconspicuous, for he is white and orange; not that he is shy, for, like most small things, he is pushful. The secret may be summed up shortly: the Harvest Mouse is inaccessible.

THE HARVEST MOUSE SUPPORTED BY HIND FEET AND TAIL AFTER RUNNING UP A CORNSTALK.

Those who would see him often must either take up quarters in a corn-stack, or roam at large among the growing crops, both of which schemes are inconvenient.

Moreover, they must choose a likely county. The distribution of the Harvest Mouse (and of the Dormouse) is of curious interest. For the moment we must confine ourselves to the former. His breeding season is a short one—say mid-June to mid-September. My own records give July 1st as the earliest date of a litter, and August 31st as the latest.

His nest is an exposed one, frequently built in the standing corn, and rarely in the hedgerow.

It is obvious that, for the welfare of the young, warm dry surroundings are essential, and it is almost startling to compare the recorded distribution of the Harvest Mouse with the July-August rainfall.

The two-inch rainfall contour for July stretches roughly from Sheppey to Worthing, and I regard the country east of this as the headquarters of the Harvest Mouse and the starting point of his distribution. That for August has its north end near Lowestoft, describes a curve whose most westerly point is somewhere near Gravesend, and sweeps back to the sea through Romney Marsh.

The three-inch lines are more irregular, and should be studied on the map.

All the counties in Great Britain from which the Harvest Mouse has been certainly recorded are wholly or partially included between these two-inch and three-inch lines.

It is extremely interesting to note records in this connection from Banff, Kincardine, Cheshire, and Cornwall, and to find how few counties there are with a July-August rainfall of less than three

inches from which the Harvest Mouse has *not* been recorded.

I have no hesitation in saying that although an occasional sporadic record may occur, it is unlikely that he will ever

THE HARVEST MOUSE FEEDING.

permanently establish himself outside the three-inch line, or that he will ever be common north of Leicester.

The breeding-nest of the Harvest Mouse is normally spherical, though its surroundings may considerably vary its shape. Gilbert White, writing on the 4th of November, 1767, likens it in size to a cricket ball (one's thoughts fly straight to Hambledon), but cricket balls have shrunk, I think, since then.

Taking the average of half-a-dozen, they are built a foot above the ground, and composed entirely of the leaves of the corn with the stalks as scaffolding. Occasionally a complete spike is found interwoven in the walls, but this is so rare that it may be considered accidental. Full advantage is taken of the growing leaves of the scaffolding. These are left attached to their stalks, and pulled upwards, downwards, and sideways into the nest, so as to form a stiffening palisade. At the base of the nest there are often three or four entire leaves. The body of the nest is composed of short lengths split longitudinally by the Mouse's teeth, but not entirely picked to pieces; these naturally contract into spirals and complicate themselves. The end of any stalk which hangs down conveniently is treated in the same way. There were 250 split-up but more or less coherent lengths in one nest which I unravelled, and, allowing for miscalculations, I should reckon that at least a hundred complete leaves had been utilised. There is no visible opening, but the structure of the nest ensures that the walls close naturally behind the Mouse's entrances and exits.

I have never found the "winter nest" of the Harvest Mouse, though there is some evidence that such a thing may exist. There seems to be no record as to how many or how few Mice have been found wintering together, but it is extremely unlikely that anything like solitary hibernation occurs with this species. In this part of the country—West Kent—the Harvest Mice winter in the stacks, often scores of them together. They show a decided preference for oat stacks, in which they live on a somewhat higher level than the House Mice. Field Mice and Meadow Mice generally avoid stacks. A number of Mice in a stack means few or no Rats, and a number of Rats means few or no Mice. The most remarkable threshing I ever attended revealed successively (1) a number of Harvest Mice, (2) a litter of Weasels, (3) a number of House Mice.

The tumult of threshing may, of course,

ANOTHER FEEDING ATTITUDE.

have had its effect on the respective positions of the Mice (the Harvest Mouse would tend to go aloft), but there could be no question as to the first-floor position of the Weasel nursery.

NEST OF A HARVEST MOUSE.

I have already described the characteristic white *ω* which borders the upper lip of the Harvest Mouse. I may, perhaps, add a few further remarks as to their colour generally, which can only be feebly suggested by photographs, and as to the remarkable—indeed, unique—quality of their tails.

The infant Harvest Mouse (I have brought up a litter of seven in captivity) follows the general rule among Mice in being a dingy sepia tint, and taking three weeks or so to find his legs (and tail). The coat of the adult is singularly beautiful. The under surface is pure white, purer, I think, than is to be found in any other British animal. The upper parts shade from a sandy red to a warm rich orange, and between upper and under parts there is a remarkably abrupt demarcation.

The orange tint is well described by Mr. Harting as "focussed on the hind quarters," but it is noticeable on the flanks and cheeks also.

Contrary to the general rule, the coat appears more brilliant in the winter. This may perhaps be accounted for by a slight bleaching of the sandy portions, which throws the orange into strong relief. The orange tint seems to be wanting in Japanese specimens.

The eye of the Harvest Mouse is distinctly small, his ears are short (for a Mouse) and lie close to his head. A full-face view of him reminds one strongly of a Red-backed Meadow Mouse. Owing to a somewhat blunted nose, his head appears thicker and broader in proportion to his body than that of a House Mouse. His nose is fleshy and very pink. This, I think, is the only drawback to his beauty.

For a long time the Harvest Mouse was considered the smallest British animal (an average specimen measures about 60 millimetres, exclusive of his tail); but the discovery of the Pygmy Shrew Mouse, whose corresponding measurement is about 45 millimetres, deprived him of this distinction, and the Lesser Horseshoe Bat (head and body, 37 millimetres) would, I think, weigh less than either.

The Harvest Mouse weighs from a sixth to a quarter of an ounce. A score of him could go by post for a penny, and ten of him will pack into a cocoanut, —less than three inches any way—and sit there happily for hours. The tail of the Harvest Mouse is unique among British tails in being prehensile. The

STUDIES OF THE HARVEST MOUSE BY DOUGLAS ENGLISH.

grasping portion of it centres in the last quarter inch. This will make a complete turn round a cornstalk, while the remainder is capable of rather more than half a turn. Owing to the under surface being flattened the tail presents an angular appearance, and a section of it appears four-sided. The vertebræ—about twenty-seven in number—reach to the extreme end. Those near the body are stout and short-waisted. The first ten shorten gradually, but the remainder shorten very quickly, becoming slender and long-waisted, and tending away from the centre of the tail to its upper surface. As a result there is little flesh above the bones in the prehensile portion, while below the bones there is a muscular cushion between one and two millimetres thick.

It is not surprising to find that this serviceable organ is incessantly employed, and that the possession of what may be fairly termed a fifth hand has turned the Harvest Mouse into a wonderful gymnast.

The vertical revolutions which a captive squirrel performs round his perch are probably familiar to most people. The Harvest Mouse could give the squirrel a lesson. He can perform a revolution at an angle of 45°, and a revolution which is practically horizontal. Once fairly started he is a living diabolo, and it is delightful to watch four or five perform together. Each does his own particular spin in his own particular way, a hand here, a foot there, a momentary grip of the tail, sometimes upon a fixed support, sometimes, timed to a nicety, on a circling companion. Occasionally two tails become entangled, whereby the combined figure is completely disorganised.

The Harvest Mouse is fond of running straight up a stalk from the bottom to the top, and, so far as most of him is concerned, beyond the top. He retains, of course, the grip of his tail and hind feet, but swings his body this way and that, and, having satisfied himself with the view and the prevailing scent, descends with equal speed, his tail following in a curious spiral motion and evidently acting as a brake.

It is not in movement alone, however, that the Harvest Mouse employs his tail. When sitting still he hitches it round, or braces it against, some fixed support. If no support presents itself he is usually uneasy, and it is amusing, under these circumstances, to watch his tail-end groping for a hold. It twists, and squirms, and asks! If you present your finger-tip it fastens to it gratefully.

Should he, however, be quite sure of his foothold (and in this case he has usually gripped his support *between* as well as with his toes), he will stick his tail out straight behind him, the prehensile portion being more or less contracted. In time, I think, this tail will do great things. The Harvest Mouse will swing by it and hang by it. At present both these feats are beyond him; but should he cultivate his jumping powers, which certainly need cultivation, he will find them essential.

The staple food of Harvest Mice is grain. Like other small rodents, they will eat insects on occasion, and, like other small rodents, they have an ugly tendency to cannibalism. I once kept a Dormouse and a Harvest Mouse together until the Dormouse devoured the Harvest Mouse, and I have found that a duel between two Harvest Mice in a community usually results in indiscriminate bloodshed and a horrid orgy of feasting.

Normally, however, Harvest Mice are peaceable, gregarious little folk, and if carefully looked after, will live for two or three years contentedly together.

It is probably the restricted breeding season which accounts for Harvest Mice being somewhat less numerous than the other species of Mice in Great Britain. Their litters are large, seven or eight young on the average, and there are probably several litters in the season. I am not aware that they have any peculiar enemies. It is said that cats will not eat them, but I have had some painful experiences to the contrary, and dogs will swallow them wholesale. They are less likely than other Mice to be caught by birds of prey; indeed, I think a Harvest Mouse would seldom be in a position where a bird of prey could get him. There may be a few stragglers left after harvest, in the stubble, but the greater proportion would be carted in the sheaves. Rats, weasels, and snakes probably account for the majority of those whose ends are untimely.

DOUGLAS ENGLISH.

"THE GARDEN THAT I LOVE."
From a Water-Colour Drawing by George S. Elgood, R.I.

THE ROMANCE OF A RIVER

By J. LOMAS, F.G.S., A.R.C.S.

ONE never feels lonely in the presence of a stream. It seems to possess a personality, and we regard it as a companion. Like other companions, it has its moods and is constant only in its changefulness. At one time it is placid and gentle, inviting us to closest communion; at another it is angry, and fierce, almost repellent in its attitude towards us. Still, it is ever fascinating, always drawing us on to closer acquaintance, and it will readily tell us its most cherished secrets if we know how to question and how to read the answer.

"NEAR ITS SOURCE IS A TINY WATERFALL."

Let us take a stream and see how far it can be induced to tell us its story. We choose an ordinary brook such as can be met with anywhere in the country, flowing through meadows and woods to join the mightier rivers and thence to the sea. Near its source is a tiny waterfall over which the water drapes itself into a smooth curved robe in summer, and splashes and foams when in flood. Why should a waterfall exist at this spot? A little hammering will soon show that a bed of rock, rather harder and more resistant than those above and below, is to be found at this point. The efforts of the stream to erode its bed have been checked, and a shelf actually overhangs the rocks under the falls. Immediately below the waterfall the bed of the stream is deep, and in the dry season, when only a little water trickles over the ledge, we see a number of deep holes which look as if they had been drilled vertically by a revolving tool. And so they have. The falling water has caused the stones which have

POT HOLE AT THE BASE OF A WATERFALL CONTAINING ROUNDED STONES.

been carried over the falls to swirl round and round, and in turning they have excavated the hollow by slow degrees.

The hollows are called "pot holes," and at the bottom of each cavity we see one or more smooth, rounded stones which in abrading the rock have themselves become abraded.

By contact with their fellows and with the world about them, they have lost their roughness and angularity and have been shaped into smooth and polished specimens of their kind. In the upper reaches the stream, full of youthful vigour, and impatient to reach its goal, cuts a channel straight and deep. It leaps the obstacles in its path, rests a little in a quiet pool to gather strength, and then sets out again on its impetuous career.

When it reaches the plain below, where the ground is covered with softer materials, such as clay, mud, and sand, it begins to meander from side to side. The slightest obstacle, such as a fallen tree or a big boulder, will cause it to swerve from the straight path. At first the swings are but little removed from a straight line, but as we proceed further down-stream they become more and more acute, until a big circular sweep is taken which almost loops the stream on itself, and only a foot or so of soil prevents the water from cutting across the barrier and flowing on in a straight line.*

When this has been accomplished it once more pursues a direct and un-

* Since the above was written (March, 1908) the barrier has been cut through and the main current has been diverted from the curved channel (*see* p. 93).

"BY CONTACT WITH THEIR FELLOWS . . . THEY HAVE LOST THEIR ROUGHNESS AND ANGULARITY."

bending course, but swampy ox-bows of stagnant water, alternating on each side of the stream, tell of sinuous wanderings in the past.

As we follow the river down-stream we find, after a time, the course once more begins to waver, the loops become more and more pronounced, and then another straight length follows. Thus we see the process of straightening proceeds up-stream, and the two phases follow each other in rhythmic pulses.

"THEN SETS OUT AGAIN ON ITS IMPETUOUS CAREER" (p. 90).

The swings of a river are sometimes compared with the swings of a pendulum. The latter, we know, are very regular, and are used as a means of measuring time. A clock is only a counting machine, which indicates by the position of the fingers on the dial how many oscillations the pendulum has made.

So, in a stream, if not disturbed by outside influences, the meanders follow definite harmonic laws, and their size depends upon two factors — the volume of water, and the velocity. In the course of the small brook which we are following we occasionally meet with a loop two or three times as large as the normal, and

"A FALLEN TREE WILL CAUSE IT TO SWERVE FROM THE STRAIGHT PATH" (p. 90).

"AT FIRST THE SWINGS ARE BUT LITTLE REMOVED FROM A STRAIGHT LINE——" (p. 90).

when this occurs a tributary always enters on the outer bend of the curve.

There are two ways in which we can approach the study of a stream; one is the statical method, the other is the dynamical method. The first would be content with an answer to the question "What is it?" The second seeks rather to find an answer to the query "What does it do?" It is the aspect of doing, which we shall keep in mind in our further investigations.

Now let us question the river closely as to its activities, and particularly as to the characteristics of its flow. It is not difficult to get exact knowledge on this point if we conduct a few simple experiments. Choosing a suitable place in a straight length we throw light objects on the surface. Pieces of paper or twigs will serve, but if the wind is blowing it is best to use a substance like sawdust, which will offer the smallest possible surface to the currents of the air. If a series of floating objects start at the same time from a line drawn across the stream, we soon observe that those near the middle outstrip those at the sides; in other words, on the surface the line of maximum velocity is near the centre. We can compare the rate of flow of surface and bottom water by putting a coloured substance soluble in water on the bed of the stream. A coloured liquid such as ink would do, but it is not easy to get the liquid to the bottom without colouring the water above. A very convenient substance is lump sugar which has been soaked in an alcoholic solution of magenta. If a cube of sugar so prepared is dropped in the stream, it sinks to the bottom, slowly dissolves, and sends out a thin, red line in the direction of the flow. In this way it may be demonstrated that the surface water moves faster than that at the

"BUT AS WE PROCEED FURTHER DOWN-STREAM THEY BECOME MORE AND MORE ACUTE" (p. 90).

"THE BARRIER HAS BEEN CUT THROUGH AND THE MAIN CURRENT HAS BEEN DIVERTED FROM THE CURVED CHANNEL" (p. 90).

bottom. It is worth while trying to picture in the mind the characteristic movements as revealed by these experiments. If a plank of wood were sliding down a hillside, all the particles would move at the same rate and preserve their relative positions, but in the case of water we find the upper layers are sliding and shearing over the lower, and the middle parts are tearing their ways through those at the sides.

Now what is the nature of the flow in

"SWAMPY OXBOWS OF STAGNANT WATER . . . TELL OF SINUOUS WANDERINGS IN THE PAST" (p. 91).

"ON THE INNER PART OF THE BEND THE GROUND IS LOW AND SLOPES GRADUALLY TO THE WATER'S EDGE."

the meandering portions of the river? Before dealing with this question it will be well to acquaint ourselves with certain features which can be observed at a bend. On the concave or outer part of a bend we note the banks are, as a rule, lofty, cliff-like and steep, whereas on the convex or inner part the ground is low and slopes gradually to the water's edge. The strand on the inner curve consists of sand or gravel, and it is usually triangular in form. American geographers call it the "toe-cap," from its resemblance to the end of a pointed boot. If the sloping bank is followed down and across the stream, it is found to end in a pool of deep water which lies immediately under the cliff on the outer curve. We have no term in general use in the English language which applies to this feature, but I once heard a Welshman describe it by a word which translated into our tongue means "turnpool," and in North Lancashire it is occasionally called the "wheel." We may take it as a general rule that the stream is deepest under the lofty cliff and shallows towards the low banks.

If we make experiments to test the flow at a bend, we note striking differences as compared with the results obtained in the straight parts.

The line of maximum flow does not follow the middle line of the stream, but takes a curve more sharply bent as shown by the dotted line in the diagram. If we watch the foam bells carried down by the current we see that they cling to the turnpool side and seem to avoid the toe-cap, and reeds and grasses growing in the brooks show, by the trend of their blades, the direction in which the current is flowing.

We can test the bottom flow by means of prepared sugar. On dropping a cube into the turnpool we find the movement is very sluggish as compared with the surface. An aureole of coloured liquid gradually forms round the sugar and then begins to drift with the current across the bed towards the toe-cap. (Indicated in the diagram by arrows.) The toe-cap is the direct product of this cross bottom current, and has been

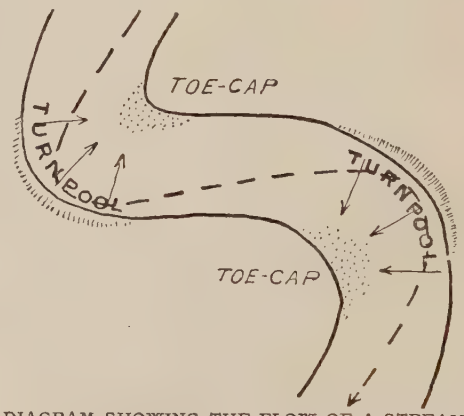


DIAGRAM SHOWING THE FLOW OF A STREAM.

formed by the gradual rolling of material towards the inner bend. Why should the undercurrent at a curve be across stream?

Careful measurements will soon show that the level of the surface is not the same at the toe-cap and over the turnpool. The direct rush of water towards the outer bend causes a heaping up at that place, and the head of water induces a cross flow.

Another line of inquiry is opened up with regard to the activities of a stream, when we consider the work it does in carving out the valley in which it flows, and its effect in modifying the contours of the land. How can moving water, so pliable and yielding, cut through even the softest rocks? Well, of itself it cannot, unless the rocks are soluble, but it can carry sand and stones in suspension or roll them along its bed, and the constant abrasion of the carried particles on the solid rocks slowly but surely causes them to yield. We should expect that the general result of running water armed with moving sand would be to produce gorges with steep parallel sides just like a vertical saw cutting into wood. That is exactly what would happen if the stream were the only agent at work. But the effects of frost, rain, and other influences are also important in the carving of the land, and a large part of the work of disintegration is done by these agents.

Their function is to widen the valley and grade the sides to a gentler slope. In those parts of the world where rain and frost are seldom met with, as in Colorado, we see the effects of the river action alone. The wonderful cañons show exactly what a river can do if left to itself for long ages. But the work of the river is not confined to the breaking up of rock masses. The disintegrated material must be carried away and deposited somewhere. In the upper reaches, where the path is steep and the current rapid, large boulders may be carried. It seems almost incredible that the tiny stream we see under ordinary circumstances should be capable of moving such large stones. In some mountain streams certain boulders have been marked and their positions carefully ascertained. Observations made year after year show that the marked boulders do move, and their rate of movement has been determined.

When it reaches the plain the current is sluggish and only capable of transporting the finer materials. There is a beautiful and delicate adjustment between the current and the material carried. The balance is disturbed in times of flood and excessive drought, but when these abnormal phases have passed, the stream adjusts itself once more and returns to a state of equilibrium.

We have now followed our type stream from the hills to the plains; there is still another part of a stream where it empties itself into the sea. Long before reaching this stage our little brook has joined its waters with others to form a large river, and the estuary can best be discussed when we pass in review some of the characteristics of larger examples.

J. Lomas.

"IT SEEMS ALMOST INCREDIBLE THAT THE TINY STREAM SHOULD BE CAPABLE OF MOVING SUCH LARGE STONES."

HOW TO KNOW THE WILD FLOWERS

By the REV. H. PUREFOY FITZGERALD, F.L.S.
With Photographs by HENRY IRVING

THE FLOWERS OF THE WOODLANDS

THE DAFFODIL.

THE woodlands provide us with the choicest of our wild flowers, not because of their rarity but on account of their profusion and their great but simple beauty. Beginning with the carpet of Wild Daffodils in the early spring, to be succeeded by masses of Primroses and Wood Anemones, and after these the Bluebells, making the ground appear a sheet of blue colour, what can be found more entrancing to the lover of flowers than a stroll in the spring and early summer through such a copse where this succession of flowers is to be found?

THE DAFFODIL

The Daffodil, or Daffy-down-dilly (*Narcissus pseudo-narcissus*), is one of the earliest heralds of spring, and as such, apart from all other reasons, is a most welcome sight. The pity is that it is not more common, for it is somewhat local, and it has disappeared from many of its former haunts, owing to the ruthless digging up of its roots for transplanting.

PLANT LIFE

THE LEAF

Specimens required :—Leaves of Laurel, Holly, Apple, Ivy, etc.

Structure

Examine specimen leaves, noting leaf blade, leaf stalk, leaf base. Note sheath at base in Wild Arum.

(*a*) *Venation.*—Examine network of veins in Laurel. Note the mid-rib. Prepare skeleton leaves by immersing in water containing chloride of lime for several days. Compare this system of venation with that of the grasses (parallel venation).

(*b*) *Serration.*—Examine the margin of an Apple leaf. Note serration. Obtain various leaves and make drawings of the various types of serration.

(*c*) *Stomata.*—Tear the outer skin from a Laurel leaf and examine under microscope. Note the pores (stomata) and guard cells. Note the function of these organs.

(*d*) *Etiolation.*—Grow any plant in darkness and note the colour of its leaves. They are bleached through the absence of light. Note reason for earthing up potatoes and celery. Refer to conditions of germination in lesson on the Seed.

Collect various leaves and classify according to shape. Press and dry specimens and mount on paper.

PLANT LIFE - THE LEAF

THE PRIMROSE.

It belongs to the family of *Amaryllis*, many members of which are very well known; it includes, beside the many forms of Daffodils now in cultivation, the Snowdrop and the two Snowflakes. The name Daffodil is probably derived from the old Latin name *asphodelus*, which was turned into Affodilly, which was further corrupted into Daffodilly.

THE PRIMROSE

The Primrose will introduce us to another family of plants, many of which are great favourites on account of their simple beauty. Notice that the leaves are all undivided, and that the green calyx (the cup into which the petals are inserted) is not divided into separate sepals; these are united, forming a tube; the sepals may be traced in the five pointed teeth. The petals also are joined, the corolla, as it is called, being divided into as many divisions as there are teeth in the calyx; similarly the number of stamens are the same as the number of divisions of the corolla, to which they are attached. If several Primrose flowers are examined, it will be seen that there are two different kinds: one in which the pistil has a long stalk or style, so that it peeps up just above the top of the tube, and the stamens are arranged on the

WOOD ANEMONE.

petals some little way below. In the other flower, just the reverse will be found; the stamens are to be seen near the top, while the pistil is quite short, so that the top of it, the stigma, reaches about half-way up. "Pin Eye" and "Thrum Eye" the two forms are commonly called, and it is a striking example of how Nature does her best to promote the cross fertilisation of flowers. Imagine an insect visiting one of the first forms, a "Pin Eye," flying on to a flower and thrusting its proboscis well down into the tube after the honey at the bottom; the arrangement of the stamens is such that the pollen would dust that part of the proboscis which, in the next flower visited (supposing this to be one of the "Thrum Eyed" forms), would come just opposite the stigma on the top of the short stem, and the pollen would be rubbed against it. If the flowers were visited in the reverse order, the same ends would be accomplished, but at a different place on the proboscis. The pollen also, if it be examined under a microscope, will be found to be larger in the case of the "Thrum-Eyed" forms, since it will have to send out a tube that will travel down the long-stemmed pistil; so that under circumstances like these it is very improbable that a flower can be fertilised by its own pollen. The same arrangements will be seen in the Cowslips, Oxlips and Polyanthus, all of which are very nearly related to the Primrose.

BLUEBELL OR WILD HYACINTH.

WOOD ANEMONE

Growing among the Primroses, and generally in considerable quantity, the Wood Anemone (*Anemone nemorosa*) will be found flowering at the same time. It is a near relation to the Buttercup. The flower dispenses with petals altogether, and in place of these has six white sepals, which are very conspicuous, and it is just as well that they are so, as the flower secretes no honey to attract the insects. The Wood Anemone has very pretty foliage, each leaf being divided into three leaflets, and these again are often subdivided nearly to the base. Apart from the ordinary leaves, which do not appear until the flower has expanded, may be found three wedge-shaped leaves halfway up the stalk. When the blossom is still in bud, the flower stalk is curled and the bud is protected by these special leaves being folded over it. The Anemone acts as a barometer, for on the approach of rain the blossoms close and hang their heads so as to shelter the pollen and other parts from the wet; they close also at evening. The name Anemone is derived from a Greek word meaning the wind, whence the common name, Windflower; but why it was so called it is difficult to say. Pliny, in his Natural

WOOD SORREL.

History of plants and animals, declares that it was because the flower never opens unless the wind is blowing.

THE BLUEBELL

The Bluebell or Wild Hyacinth (*Scilla Nutans*) is a well-known favourite, and nothing is more charming than masses of these growing under the trees, giving, in the distance, the idea of a blue carpet. The plant springs from a white bulb, full of juice, and the leaves and flowering stems all rise straight from the ground, the former being shorter than the flower stems. The flowers are borne in a one-sided raceme or row, each one drooping on its tiny stalk, and each one with a small leaf or bract at the base; the blossoms hanging down as they do from the flowering stem are well protected from the rain.

WOOD SORREL

The Wood Sorrel (*Oxalis Acetosella*) belongs to the Geranium family; it is one of our most graceful wild flowers. It delights in a moist, shady spot, and flowers about April or May, and is very often in the company of Primroses and Wood Anemones. Dig up a plant and you will see that it has a slender, creeping rootstock, which is generally covered with bright red scales. The leaves spring from this, each leaf bearing three leaflets, like the clover, green above and somewhat purple beneath; these leaflets droop as

WILD STRAWBERRY.

WOOD SPURGE.

night approaches and also in bad weather, and they will often do so if the stems are sharply struck. One rather large white flower is borne on each peduncle, and if one of these is examined it will be seen that it has five small green sepals, five petals, with delicate purplish-pink veins, and the stamens arranged in two rows, and five stigmas, while half-way up the flower stem will be seen two tiny little leaves or bracts. The seed vessel is worth looking into: it is surrounded by a cup-like covering which is very elastic, and when this arrives at a certain state of dryness, any small shock is sufficient to make it burst, and the seeds are flung out in all directions with considerable force.

The Wood Sorrel is an example of those plants which produce two distinct kinds of flowers, for during the summer may be found a number of buds which never open, but which eventually develop into seed vessels; the Violets also have this peculiarity.

This plant was in all likelihood the original Shamrock used by St. Patrick as a symbol of the truth of the Trinity, but the name is now applied to other trefoils, and the Wood Sorrel is no longer used as the Shamrock on St. Patrick's Day. Other local names for it are Three-leaved grass, Cuckoo's Meat, Cuckoo Sorrel and Stub-wort, the latter because it often grows among tree stubs. The leaves have a very acid flavour, and are sometimes used for salad; the acidity is due to a salt of oxalic acid, which can be obtained as crystals by distilling the leaves.

FOXGLOVE.

WILD STRAWBERRY

The Wild Strawberry (*Fragaria vesca*) will be found in flower from May to July, and will be readily recognised from its similarity to the cultivated kinds, but possibly, as was pointed out in the chapter on Wayside Flowers, the Barren Strawberry (*Potentilla fragariastrum*) may be mistaken for it. On examining the fruits of the two plants, the difference will be readily seen, for in the *Potentilla* the fruit is hairy, dry, and very uninviting. In the Strawberry it is red and luscious; and the differences will be noticed in even the early stages of fruiting. The leaves are dark green in colour and divided into three leaflets, more or less covered with soft, silky hairs. The plant sends out runners from the rootstock, which creep along the ground, and these at intervals take root, forming at each joint a new, young plant, so that the Strawberry has discovered a way of increasing its own species, apart from its attractive fruit. As to the name, there is some doubt as to why it was adopted. The old spelling was Streowberry, and a local name was Strayberry. It seems likely that both names have come from the runners being strewn on the ground, enabling the plant to stray from home.

WOOD SANICLE.

THE WOOD SPURGE

The Wood Spurge (*Euphorbia amygdaloides*) is a curious-looking plant, very commonly found in the South of England, but not so frequently in the Midlands, and still rarer in the North. It belongs to a family of plants some of which are very poisonous, and a few possess valuable medicinal properties, such as the Castor Oil plant. The stems are generally of a reddish colour, and most of the green flowers spring from the centre of a rosette of leaves, forming an umbel; a few single flowers are also to be found up the stem. Each bloom consists of a pair of yellowish-green floral leaves, which are connected so as to form one large, round leaf; inside will be seen several stamens, and in the centre a female flower, supported on a short stalk, and curving downwards; in reality, each stamen is a single male flower, so that we have here an instance of many single flowers being collected in one head, a sort of co-operative society; you will notice also some curious crescent-shaped glands with rather long points. The milky juice of this plant is extremely acid, and has an ulcerating effect on the skin. It is sometimes used to cure warts, but it should be applied with great caution, and, in fact, had better be left alone.

FOXGLOVE

The stately Foxglove (*Digitalis purpurea*) is a well-known denizen of the woodland, and a copse where this plant is growing in masses is a sight worth seeing. Several facts which have already been noticed with regard to other flowers are also to be observed here. The long stem bears a great many blossoms, so that the insect visitors need waste no time in

passing from flower to flower and collecting the honey situated deep down at the base. Watch a plant, if you have the time, and look for a humble bee alighting on the bell. You will see that the shape of the flower agrees exactly with that of the bee's body. And this is, in fact, the only insect that fertilises the plant. The stamens ripen before the pistil, two at a time, and at first the anthers, where the pollen is stored, are in a horizontal position; when ripe, these become vertical. The pendulous habit of the blossoms protect the various organs from the rain.

As to the name Foxglove, no one seems to have been able to give a satisfactory derivation of it, and the meaning will probably remain in obscurity.

WOOD SANICLE

Another plant which is frequently met with is the Wood Sanicle (*Sanicula europæa*) with pretty, divided, very glossy foliage, and small, round heads of white flowers, arranged in an umbel. The small, outer flowers bear stamens only; the fruit is flattened and oval in shape, and is provided with numerous hooked prickles, which catch hold of anything that touch them, so that they have the chance of being widely disseminated. The flowers will be found during June and July.

H. PUREFOY FITZGERALD.

HOW TO KNOW THE WILD ANIMALS

By DOUGLAS ENGLISH, B.A., F.R.P.S.

Author of "Wee Tim'rous Beasties," etc.

THE DORMOUSE

With Photographs by the Author

MOST of us, I imagine, derived our first conception of a Dormouse from the immortal tea-party:

"'Treacle,' said the Dormouse, 'without considering at all this time.'"

Whereby hangs an amazing tale. Messrs. Newstead and Walker, while moth-collecting at Colwyn Bay, captured a Dormouse at sugar.* This Dormouse, I think, must have been like his captors—an entomologist. A Hedgehog has a low taste for rum, but a Dormouse? Yet there is a record of one nibbling honeysuckle for the nectar, and it must be confessed that a Dormouse is by no means particular in his diet.

The following are some of the eatables which have been described as welcome to him by various authors: hazel-nuts of course, acorns, grubs, birds' eggs, apples, grapes, raisins, bacon fat, cherries, any kind of corn, porridge, bread and milk, and sponge cake.

* Proc. Chester Soc. Nat. Science, 1893, p. 248.

In spite of the historic complaint of the little girl that her Dormouse "had no habits," he is, and will always be, a favourite pet for the nursery. "It has no smell, either good or bad," writes Buffon gravely. But, apart from this excellent quality, a vicious Dormouse is exceptional. "'I wish you would not squeeze so,' said the Dormouse . . . and he got up very sulkily and crossed over to the other side of the court."

That is the Dormouse all over. He resents over-attention. He will move (sulkily, if you will) as far from you as possible, but he will never bite.

Well—hardly ever.

One sits beside me as I write, and him I can only describe as a savage little beast. He has often tasted my blood, but I cherish some affection for him. The world has used him hardly. He was caught in March, 1907, full grown and, for the time of year, robust. One ear had gone, and three parts of his tail.

Both wounds had been long healed. There was a crinkle where an ear should be, and hair concealed the indecorous tail-stump.* A slashing blow this must have been. An owl, perhaps; more probably a cat. I doubt if Dormice fall a prey to Owls. The food of Owls can be very fairly determined by their pellets. I know no case of the remains of either Harvest Mice or Dormice. Those of Shrews, Field Mice, House Mice, and Meadow Mice are common.

A loss of tail must, one would think, be a serious matter for a Dormouse. Yet, as youthful investigators are quick to discover, the tail strips easily. Why it strips easily I know not. The rings are decidedly closer together than is the case with the true Mice, almost in the proportion of three to two, and the tail is very fleshy, measuring, without the hair, about four millimetres across, and double this with the hair. The hair grows on it in a succession of whorls, and its under surface presents in a good light a distinctly banded appearance.

In his active period—say April to November—there is little doubt that the Dormouse employs his tail as a parachute. He is a prodigious leaper, but his movements are generally so quick and so difficult to follow among the branches, that I have not been able to satisfy myself of the way he carries his tail in jumping. I am inclined to think that it is arched downwards, and that its hair, as well as the hair on his sides, spreads out and steadies his flight.

THE DORMOUSE.
Showing the large size of his eyes and stoutness of his feet and hands.

The Dormouse sleeps, after the fashion of mouse-kind, with his head tucked down, his four limbs brought well together and his tail swept round outside him.

During hibernation, however—that unconscious portion of his existence from which presumably his nickname "Sleeper" is derived—his attitude is, as may be seen from the picture (p. 104), peculiarly constrained.

Animal hibernation has but little in common with sleep. It may be roughly defined as a condition of torpidity induced by a fall of body temperature, and in some of its features—rigidity, for example, and response to certain stimuli—presents an hypnotic character.

Hibernation may be complete or partial. In complete hibernation, a condition which is induced in the Dormouse by a fall of body temperature a degree or two below 50° F., the vital functions are, to all outward appearance, completely suspended.

The Mouse has no power of voluntary motion; its breathing is imperceptible; it is cold to the touch. Anyone unacquainted with the condition would certainly assume it to be dead.

* Since writing the above my small friend has died. A post-mortem revealed that half his upper jaw had been carried away also.

I do not know that any reliable investigations have yet been made of the circumstances attending normal hibernation in animals. The investigation is, in any case, an extremely difficult one, and one of the most interesting points in connection with it, the determination of the body temperature of the animal in relation to the temperature of the surrounding air, must always involve the risk of gravely disturbing the normal conditions, if not, indeed, of killing the animal outright.

HIBERNATING DORMOUSE.
The attitude is designed to shield the vital organs.

Such evidence as exists seems to show that the body temperature of a hibernating animal corresponds fairly closely with the temperature of the surrounding air, so that we have the remarkable phenomenon of a warm-blooded animal assuming, during certain definite periods of its existence, one of the peculiar characteristics of a cold-blooded animal.

The question as to what happens when the temperature of the surrounding air falls to freezing point will naturally present itself, and it must be remembered that, in the case of animals like the Dormouse and Hedgehog, whose winter quarters are above ground level, such a contingency is by no means impossible.

It is inconceivable, from a mechanical standpoint, that either of these highly organised animals could survive being actually frozen. We must assume, therefore, either that extreme cold will rouse them (in the Hedgehog a body temperature of 38° F. has been recorded), or, as is more likely, that there is some working source of heat within their bodies which, slight though it may be, is yet sufficient to keep their body temperatures under all circumstances above 32° F.

I cannot regard the usual explanation, that

DORMOUSE.
Showing the bushy character of the tail and the apparent shortness of the limbs.

this heat is supplied by the slow combustion of fat amassed during the summer, as convincing. It is by no means certain that hibernating animals lose weight normally, and it is difficult to see how, in the absence of respiration, perspiration and excretion, the products of such combustion are got rid of.

It would seem more reasonable to suppose that Nature has devised some scheme of utilising inside the animal the considerable heat which becomes latent when the animal, in the ordinary course of its existence, is breathing or perspiring.

There is no doubt, I think, that the distribution of the Dormouse is primarily governed by the same causes as those which determine the distribution of the Harvest Mouse. He has a short breeding season (August and September), and he builds an exposed nest above ground level. So long as his young are hairless they require warm, dry surroundings.

His breeding-nest is more substantial than that of the Harvest Mouse, and, since the absence of sunshine is not of much concern to him, it is not surprising to find that in Wales he ranges westward of the three-inch August-September rainfall. The four-inch line, however, checks him.

The normal winter sleep of the Dormouse commences in late October and lasts till April. His progress northward has naturally stopped where the mean October temperature falls below 50° F.

He is therefore unknown in Scotland, and rare north of the Midlands.

Mr. Forrest has studied the breeding habits of the Dormouse, and finds that "the doe constructs a fairly large nest for the reception of her family, placing it either in a hedge or in a hazel or other small tree, especially such as are draped with hanging masses of honeysuckle."*

This preference for honeysuckle is curious; the plant may be seen in my photograph of a nest. It is possible that the mother may find honeysuckle a good tonic.

Mr. Forrest proceeds to tell us that "the buck constructs himself a separate nest within a few yards." The picture of father-mouse being relegated to the spare room is delightful. One would like to think of the pair supervising the construction of the youngsters' winter quarters, and of a general reunion in the spring, but facts, I fear, are against it.

NEST OF DORMOUSE IN FURZE-BUSH IN WHICH HONEYSUCKLE IS ENTWINED.

The winter nests are quite separate from the breeding nests, and never contain more than one tenant. Cases have been known of the adaptation of an old birds' nest, but generally they are situated about ground level, and composed of moss and fairly substantial leaves.

The Dormouse does not look like a jumper. One misses the muscular

* "Fauna of North Wales," H. E. Forrest.

development of the hind legs, which is so noticeable in the Field Mouse and the Squirrel. The difference, I think, is merely an external one, and is due to the fact that the looseness of his skin, and the shortness of his feet and hands, which appear to issue straight from the fur, conceal to some extent the true set of his limbs. He has enormous muscles on the shoulder and upper arm, as well as on the thighs. The feet and hands are stoutly built. In the latter the pads at the finger-tips and between the bases

NUTS GNAWED BY MICE.
Upper row gnawed by Long-tailed Field Mouse. Middle row by Dormouse. Lower row by Red-backed Meadow Mouse.

of the fingers are rather small, but the two at the wrist are extremely large, and the shortness of the palm brings all ten pads close together, forming an excellent cushion on which to land his weight. The pads of his hind feet, owing to the shortness of the sole, coalesce in a similar way.

For a non-burrowing animal, he has a well-developed collar-bone; and his internal structure renders it impossible for him ever to fall a victim to appendicitis.

His eyes are extremely large and beautiful, projecting strongly from the head and possessing probably an even greater range of vision than those of the Field Mouse. It is interesting in this connection to note that the Dormouse does not crouch and depress the nape of his neck when frightened. Flight is his first impulse.

Being essentially a twilight beastie the Dormouse is seldom seen abroad, and the first clue that one has to his presence in a garden (he is fond of gardens) is the *débris* of his meals. The nut which the Dormouse has eaten is unmistakable. Squirrels, Field Mice, and Red-backed Meadow Mice attack their nuts impetuously. The Squirrel scarcely troubles to gnaw at all. A scratch or two gives him a tooth-hold. Then he bites sharply. Often the shell splits cleanly in two portions. Sometimes it needs a second bite. The whole action is impatient.

The methods of the Field Mouse and Meadow Mouse resemble each other. Both gnaw somewhat at random, and will sometimes leave a spot where they have reached the kernel, and give themselves the additional labour of making another entrance. This is largely due to the fact that they fumble with the nut, and do not lift it. If all goes well, however, their first incision is near the pointed end of the nut, and from this their working spreads irregularly. They gnaw a certain space, eat as much as they can reach, and then gnaw on.

The Dormouse is more workmanlike. He sits back on his haunches and lifts the nut between his hands. Usually he holds it with the point towards himself, and invariably, I think, he commences at the edge of the circular patch.

The finished hole is remarkably regular. In a fat, round nut it is circular, in a long, thin nut it is elliptical. The diameter, when circular, and the long diameter, when elliptical, are strictly proportional to the dimensions of the nut, and a series of measurements has shown me that with a hole of 7 millimetres diameter, and a depth of not more than double this from the edge of the hole to the uttermost parts of the nut, the Dormouse can manage the entire kernel. Considering that a hole of this size only admits his nose to the extent of about 6 millimetres, one cannot but admire his skill and wonder how he does it.

DOUGLAS ENGLISH.

HOW TO KNOW THE TREES GROWING IN BRITAIN

With Notes, descriptive and photographic, for their Identification in all Seasons of the Year

By HENRY IRVING

THE SWEET CHESTNUT

WE are compelled to conform to common usage in speaking of this tree as the Sweet Chestnut, as though it and the Horse Chestnut were in some way allied; whereas they are not even distantly related. Except for the single fact that their fruits (though one is a fruit and the other a seed) are somewhat similar in outward appearance, they differ in every possible particular. This is *the* chestnut, whatever the Horse Chestnut may be. Native to the Sunny South lands, it is said to have been brought here by the Romans; so it has had time to make itself fairly at home. Yet it is chiefly to be found in planted parks and not in our wild woods. It is, however, much used as undergrowth to form cover for game.

TRUNK OF SWEET CHESTNUT.

In force of character the Chestnut is a close rival of the Oak. Growing more erect, it, nevertheless, gives a similar impression of sturdy strength. There is something gladiatorial in its pose and bearing. Firm-set, erect, massive, muscular, it were no very far flight to imagine a readiness to give, or take, blow, or throw.

In *winter* the sturdy column of the central stem is seen to taper little to a considerable height. It bears comparatively short but heavy branches which follow a like habit. These are carried horizontally as on the Oak. They dip more at the extremities, and are retained generally at a lower level, often sweeping the ground. The smaller branchings from these have a drooping tendency, which may be compared to falling drapery from an extended arm.

In *spring* the first colour of the young leaves, spreading over the surface of the tree, is ruddy. This soon gives place to a clear, deep green. Not till late spring, or even early summer, do the catkins

mature. Then the whole tree glows from lowest branch to summit with stars as of pale gold, radiant.

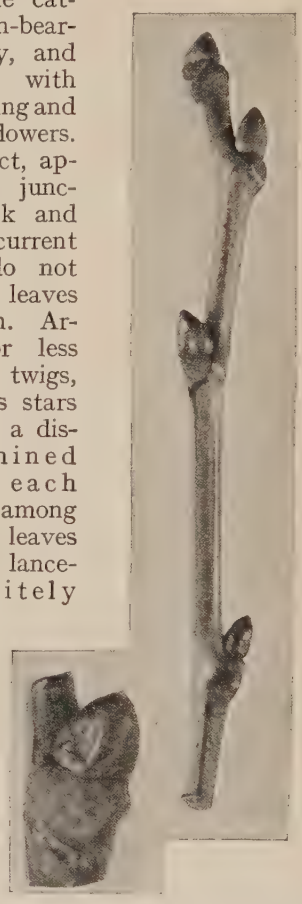
SWEET CHESTNUT LEAVES.

In *summer* the general effect is massive, with rounded mounds of foliage completely covering and hiding, as with a thick mantle, the sturdy limbs; deep green, but relieved by light reflections from the bright leaf-surfaces.

In *autumn* the colour changes to lemon yellow, deepening to gold, and then to dull brown in the fall, which takes place earlier than with the Oak and Beech; but beneath the Chestnut is no rich glistering carpet of leaves, only dull, sodden brown.

The *trunk* is columnar, tapering little, upstanding to the summit. The *bark* is thick and deeply furrowed. The furrows are longitudinally placed, but in age tend to twist, presenting sometimes the appearance as of thick strands in a great cable. The colour is dark grey. The *winter twigs* are brown, stiff, angular, with strongly defined ridges passing upwards as though to support the prominent leaf cushions, above which, as upon brackets, the resting buds are placed, though somewhat awry in relation to the leaf-scars. The *resting buds* are yellowish green changing to red, thick-set like those of the Oak, but show only two outer scales. They are arranged alternately on the twig, but on erect shoots the arrangement becomes spiral. The leaf-scar is triangular with angles rounded off, and shows usually three groups of leaf-traces. The *leaves* are large, 7 to 9 inches long, narrow in relation to their length, tapering to a point at each end. They have decided teeth at regular short intervals all round, these having a forward direction like those of a "rip" saw. The midrib is in continuance of the stalk to the apex, with ribs on either side (about twenty pairs of them), each ending in a sharp tooth at the margin.

The *flowers* are arranged in catkins, of which there are two kinds, both found on the same tree. These are simple catkins with pollen-bearing flowers only, and mixed catkins with both pollen-bearing and fruit-producing flowers. Both stand erect, appearing at the junction of leaf-stalk and twig of the current year. They do not mature till the leaves are fully grown. Arranged more or less spirally on the twigs, they radiate as stars when seen from a distance. Examined separately, each emerges from among the shield-like leaves as a glittering lance-head exquisitely poised. The catkins with pollen-bearing flowers only grow lower down the twig, and mature first, putting out their many stamens from the base



SWEET CHESTNUT WINTER TWIG AND ENLARGED VIEW OF BUD WITH LEAF-SCAR.

SWEET CHESTNUT IN WINTER AND SUMMER.

upwards. The mixed catkins grow near the tips of the shoots, and carry pollen-bearing flowers on the upper four-fifths of their length. On the lower one-fifth are two or three green rosettes with reddish threads protruding. These are the fruit-producing flowers. The pollen is conveyed from flower to flower mainly by the wind, but also to some extent by the visitation of numerous small insects that find the catkins in some way attractive to them, though the flowers secrete no nectar.

The *fruit* is enclosed in a casket which presents the appearance of a diminutive hedgehog on the defensive, with sharp spines projecting every way. When ripe this casket splits open crosswise, exposing the brown nuts. In this country, as a rule, not more than one of these nuts matures. It is roundish, drawn up to a point, something like a bag of which the strings have been tightly drawn to close it when full. Those that have failed are like similar bags, but empty, with their sides pressed together. At the top of the nut stands erect a little tuft, the remains of the stigmas from the time of flowering.

HENRY IRVING.

HOW TO KNOW THE BIRDS

By the REV. MAURICE C. H. BIRD, M.A., M.B.O.U.

With Photographs by
RICHARD AND CHERRY KEARTON

TITS, PIPITS, AND LARKS

THE chief distinctive mark of the Golden-crested Wren is its diminutive size. It is the smallest British bird. About five of them go to the ounce! In body colour they approach the Willow Wren, but are not quite so delicately elongated in appearance, and are more Tit-like in their habits and attitudes. Both male and female have the yellow crown, but it is not developed in the young until after the first month. The sexual difference in the depth of colour might lead a casual observer to mistake the male Gold-crest for an example of the rare Fire-crest, but the latter, besides having a really deeper orange crown, and being a slightly larger bird, has also a dark eye-stripe extending to the nape of the neck. Both species are partial to coniferous trees, and young plantations of such are especially attractive. Gold-crests frequently choose the Spruce Fir as a nesting site, but where unclipped Yews abound their lovely, somewhat Chaffinch-like nest is more usually suspended from the ends of branches of the last-named tree. It is a marvel how these tiny specks of bird life can endure a sea passage, but thousands reach the East Coast from the Continent every autumn,

YOUNG BLUE TIT.

COAL TIT VISITING ITS YOUNG.

and it is at this season of the year when they are most likely to attract the attention of the roadside naturalist, for when summer foliage clothes the trees and bushes such minute birds may easily escape notice. Moreover, fewer remain to breed with us than winter here.

The Tits too, as their name suggests, are a family of very small birds, remarkable for their activity and energy, being constantly on the move, flitting and climbing about in search of food, their curious attitudes and acrobatic performances being delightful to watch. The Great Tit is, as its adjective implies, the largest of the five commoner representatives of the family—a bold, handsome bird with white cheeks and yellow waistcoat divided down the middle by a jet black stripe. The Blue Tit is conspicuously named, and cannot at any age or season be confounded with either of its congeners. Both these birds are easily attracted to "bird tables" in winter, and delight in a suspended cocoa-nut or piece of suet. The less widely distributed, or at any rate less common and confiding Marsh and Coal Tits, may be distinguished from one another by remembering that the former has no conspicuous white at all on the head, nor yellow on the breast, whilst the latter has a patch of white at the base of the skull, the nape of the neck as well as the cheeks being white, which distinguishes it from the Great Tit, the latter being quite an inch longer than either Marsh, Coal, or Blue Tit.

All four species nest in holes of trees or masonry, the Great and Blue Tits being most easily accommodated, utilising upon occasions most curious nesting sites—a letter box or a disused pump. Marsh and Coal Tits are more shy and retiring, the former seldom venturing near houses for breeding purposes, and always building near the ground.

GREAT TITS.

The Long-tailed Tit makes a most elaborate nest, dome-shaped like that of the Wren, but outwardly composed chiefly of grey lichen, felted together with moss and cobwebs, and in-

BLUE TIT FEEDING ON A SUSPENDED NUT-KERNEL.

variably lined thickly with feathers—a cosy nursery for the second smallest of British birds. The numerous family keep together with their parents until the following spring, roving about meanwhile far from their early home. A very pretty sight it is to watch their undulating tandem flights from tree to tree, uttering meanwhile their sweet soft call-notes, "zit-zit." It has been suggested that their curiously elongated tail is of use as a balancing pole whilst searching wind-tossed tree-tops for insect food, but it must be much in the way during the fortnight of incubation, in which both sexes take part.

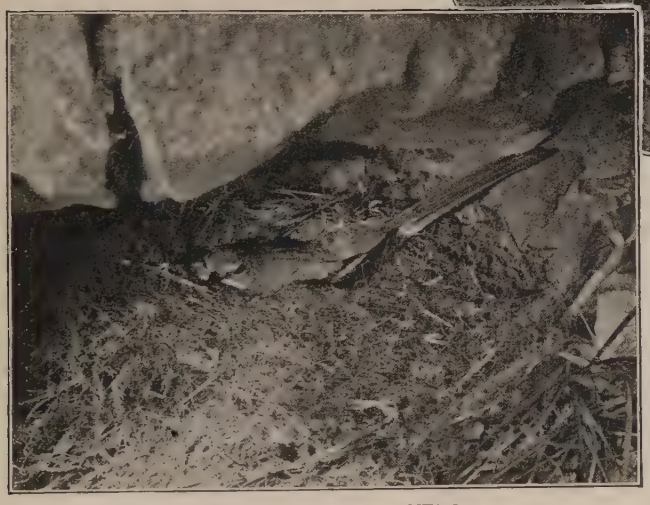
MARSH TIT AND NESTING SITE.

Length of tail is likewise a distinguishing feature of the Wagtail family, of which we have three forms that must be mentioned as of more or less frequent occurrence: the partly resident and widely distributed Pied or Common Wagtail; the Yellow, which is a summer migrant; and the rarer and more local, longer-tailed, more variously coloured and most elegantly formed Grey Wagtail. A distinguishing feature of this graceful family is that when on the ground they walk sedately, instead of hopping as the generality of small birds; they run nimbly and stop as suddenly, when the specific tail-wagging, or rather see-sawing, is complacently indulged in. In summer some few White Wagtails visit us, and may easily be mistaken for our common form; the chief distinguishing marks are that the back and wings of the latter are greyer, and there is more white on head and neck. It has a well-defined black hood, and the white on the cheeks sharply separates the black on the head from that on throat and breast. In winter the two species are not so clearly differentiated, and the young in both species have the cheeks and throat tinged with yellow.

All the family specially frequent the neighbourhood of water, but the Pied is the most ubiquitous and least fastidious in this respect, and may frequently be observed upon freshly ploughed fields in comparatively dry districts. The Yellow Wagtail chiefly confines itself to marshy localities, and the Grey to mountainous districts and running streams. The lovely blending of the bluish-grey upper parts, black garget, bright yellow under parts, white-edged tail and wings, render it one of the most beautiful of British birds.

The cinematograph has already lent aid to ornithology, one of the Messrs. Kearton's films bearing witness to the relationship existing between the Wagtails and Pipits by portraying a Meadow Pipit in the act of tail-wagging. Both name and note will assist us in distinguishing this bird of pasture and uncultivated land from the two other less widely distributed representatives of the genus; for although the feeble song and complaining, mournful call-notes, "peep, peep," of both Meadow and Rock Pipit are somewhat similar, the latter bird never leaves the coast, although it may be found on muddy as well as on rocky shores. The Tree Pipit is a regular summer migrant, and has a pretty song. It frequents the outskirts of woodlands for preference, and may be identified by Yarrell's oft-quoted description: "He sometimes sings while sitting on the top of a bush or one of the upper branches of a tall tree; but most generally, starting from such a perch, he will be seen to ascend on quivering wings about as high again as the tree; then, steadying his wings, expanding his tail, and letting his legs hang straight down, he descends slowly by a half-circle, singing the whole time, to the same branch, or to the top of some other tree near by, without ever alighting on the ground mean-

LONG-TAILED TIT AND NEST.



GREY WAGTAIL ON NEST.

while. So constant is this habit with him, that if the observer does not approach too near to alarm him the

PIED WAGTAIL.

bird may be seen to perform this same evolution twenty times in half an hour, and it is most frequently witnessed during and after a warm May or June shower."

This habit will at once distinguish him from the somewhat smaller Meadow and somewhat larger Rock Pipit. All three are sombre clad, genteel, Sparrow-like birds. The general brown plumage of the Rock Pipit is relieved by a shade of olive, and the breast spots are more conspicuous than those of the Meadow

TREE PIPIT ON NEST.

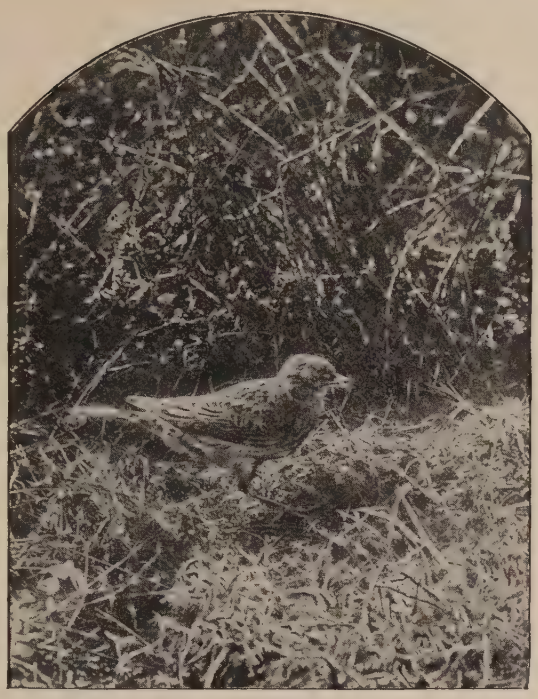
Pipit, and the similarity of the Tree Pipit to a diminutive and alert Song Thrush has frequently struck me. All three species nest on the ground, and their alternative title of Titlarks proclaims their affinity and proportion in size to the true Larks—a family of birds with which they share a beautiful adaptation of footgear, in that in those species which frequent grass land, and spend most of their time on the ground, the hind claw is greatly prolonged, enabling them to walk with ease upon a dense carpet of vegetation; whilst in the Tree Pipit the hind claw is curved, to suit its arboreal propensities, though not to so great an extent as is the case with the Rock Pipit. The latter bird has two dull-white alar bars, and the outer feathers do not show distinctly

MEADOW PIPIT.

white in flight, as is to some extent the case with the Tree Pipit, but most conspicuously in the Meadow Pipit. Some of these minor differences in such small birds may be difficult to discern whilst the subjects are at large, but field-glasses are so easily available and so very useful, that no student of wild-life should travel without them.

With the Pipits we have reached the end of the first tribe of the Passerine —Sparrow-like, or perching birds, to which Linnæus gave the name of *Dentirostres*, because they have the upper mandible more or less distinctly notched on each side. With the closely allied Larks, we commence the second Passerine tribe of *Conirostres*, or hard-billed birds, their stronger and more cone-shaped mandibles lacking the tooth-like beak

indentation, but they retain the straight hind-toe claw of the Pipits, and the sexual plumage does not vary. Though more strictly vegetarian than the Pipits, the Larks, in common with nearly all the smaller birds, feed their young chiefly on insects. The Lark is the only bird that I have ever seen taking a Garden White butterfly — perhaps it was a young bird that had yet to learn the warning intention of conspicuous coloration. The well-known song of the Skylark, though generally delivered whilst soaring, is sometimes uttered, in shortened form, from the ground; and although the habit is not frequent, I have more than once seen a Lark perched on a closely-cut hedge, and have timed the spirally sung song as lasting for over four minutes.



SKYLARK.

The resident but local Wood Lark, best described as a small Skylark with short tail and curved hind claw, sings whilst it hangs poised in the air. Skylarks often rise and fall perpendicularly as they sing, whilst the Meadow and Tree Pipits

SKYLARK FEEDING HER YOUNG.

rise and fall in large curves singing only as they descend.

The Wood Lark is silent usually after mid-summer as are also Thrush, Blackbird and Willow Wren, but the cessation of song cannot be presumed upon as a certain aid to identification, for it is a constant accompaniment to nesting, and if by any means the first attempt at breeding comes to naught, the season of song is then prolonged, and many birds that have been silent previously for some weeks sing again with subdued and shortened notes in early autumn.

Early morning is the most likely time for hearing the first spring notes of most species, and it is then that the song is generally most prolonged. At 4.50 a.m. on April 26th, 1908, I counted the welcome "Cuckoo" 87 times without intermission, and at 6.45 a.m. on June 24th, 1885, no fewer than 227 times!

MAURICE C. H. BIRD.

HOW TO KNOW THE CLOUDS

By WILLIAM J. S. LOCKYER, M.A., Ph.D., F.R.A.S.

With Photographs by the Author

III

IF the reader will look back at the cloud classification scheme he will see that we have now arrived at the heading "clouds of ascending currents," and under it two forms of clouds are mentioned—namely, *cumulus* and *cumulo-nimbus*. The reason why these two types are put in a class by themselves is that they owe their origin to the daily heating of the land by the sun, and the consequent warming and rising up of the air to higher levels. When this warm moist air reaches altitudes in which it can no longer maintain its moisture in the invisible form, the vapour becomes apparent in the form of a cumulus cloud. On this account cumulus clouds are more common in summer than in winter, and at midday more often than in the early morning and late evening.

The reader will have no difficulty in differentiating a cumulus type of cloud from other types. Briefly, it may be described as a thick cloud, the upper portion of which is dome-shaped, or sometimes, when the cloud is large, like a cauliflower, and exhibits protuberances, while its base is usually horizontal.

"If woolly fleeces spread the Heavenly way,
Be sure no rain disturbs the summer day."

The photograph on the opposite page illustrates these small woolly cumuli, which are often seen sailing along above or past us during the summer months.

This photograph was taken at Tunbridge Wells on May 18th, 1907, at 10.15 a.m., the camera being pointed nearly due west. When such clouds pass before the sun they appear very dark with brilliant edges, and sometimes when they are not too thick they present a fine spectacle.

It is on these occasions that one sometimes sees the very pretty effect of solar beams being shot out from behind the dark cloud. These shafts of light are, of course, only the interspaces between the shadows of the irregular portions of the cloud which are cast on the air; on some days they are rendered far more prominent than on others, but this may probably depend on some particular condition of the atmosphere. It is an old idea that the appearance of these rays indicates coming rain, as the following, out of many old sayings, will show:

"The sun is getting up his back stays,
And it is time to look out for bad weather."

Perhaps, as the rays are only formed when low clouds pass across the sun,

and these are generally cumulo-nimbi or cumuli, the deduction is somewhat logical. Most picturesque photographs of these rays and clouds can be easily secured, but lack of space prevents one from being reproduced here.

type. The cumulo-nimbus is always associated with rain or snow or hail.

In the lower illustration on page 118 the shower cloud form of cumulo-nimbus is illustrated. The shower cloud is usually somewhat larger than the ordinary sum-

CUMULUS CLOUDS.
From a Photograph taken at Tunbridge Wells, May 18th, 1907, at 10.15 a.m.

On some days cumuli appear as if partially broken up by strong winds, the detached portions undergoing continual changes. They are then termed *fracto-cumuli*. An example of this type is shown on page 118, which is from a photograph taken at South Kensington.

We now come to another form of cumulus, termed *cumulo-nimbus*. This is the thunder or shower cloud. It consists of heavy masses of clouds towering up in the form of mountains, turrets, or anvils. They are generally accompanied by a sheet of thin, streaky cloud above them, termed "false cirrus," while underneath is a mass of cloud of the nimbus mer cumulus, but much smaller than the thunder cloud. The well-known saying:

> "A round-topped cloud, with flattened base,
> Carries rainfall in its face,"

very well describes this type of cloud and its rainy character. The particular one here shown dropped rain heavily as it passed over the position of the camera, thus proving its nimbus character; while its dome-shaped top renders it a cumulo-nimbus. The photograph was taken at Tunbridge Wells on May 18th, 1907, at 11 o'clock.

The next illustration will give the reader some idea of the enormous dimen-

FRACTO-CUMULI CLOUDS.

CUMULO-NIMBUS CLOUD.
This is a shower cloud and comparatively small.

sions to which cumulus clouds attain, but he must remember that the cloud in question was a great distance off. This cloud had the appearance of being of the cumulo-nimbus type, although one could not be certain, as it did not pass overhead.

CUMULO-NIMBUS CLOUD.
Photographed at a great distance, and is therefore of very large dimensions.

It was possibly in the initial stage of becoming a thunder cloud, although it had not then begun to flatten out at the top and assume the anvil form, the general feature of thunder clouds. The photograph from which this reproduction has been made was taken at South Kensington in 1906 on May 25 at 9.30 in the morning.

The great heights to which thunder clouds can attain may be gathered from the fact that they sometimes reach the level of the upper clouds, the average heights of which are about 29,500 feet. Measurements have shown that while the base of a cumulo-nimbus may be about 4,700 feet from the ground, its apex or top may extend to an altitude of about 26,000 feet; the vertical thickness of such a cloud measures then approximately 21,500 feet. When we remember that Mount Everest, the highest mountain in the world, rises 29,000 feet from sea level, some idea of the magnitude of these clouds may be grasped.

It sometimes happens that the under surface of a cumulo-nimbus presents a mammillated appearance—that is, droops downwards, like a festoon of drapery. When this is the case it is termed *mammato-* or *festooned-cumulus*. This peculiar feature does not seem to be of common occurrence in this country, and I have only noticed it on two occasions. Fortunately, on one of these, May 21st, 1906, at 1.30 p.m., the camera was available, but the feature was somewhat less pro-

nounced when the photograph was taken. The reproduction on this page will serve to render some idea of the peculiar appearance of the cloud.

We come now to the last type of cloud —namely, the *stratus*, a form with which we are all very familiar, it being nothing more than an ordinary fog lifted up from the ground. Sometimes it is broken here and there by the wind, and exposes the blue sky overhead, or the summits of mountains penetrate it. On these occasions it may be distinguished by the name of *fracto-stratus* to differentiate it from the unbroken sheet.

Those who live in hilly districts can often tell successfully the kind of weather that will prevail by close observation of the behaviour of these low clouds. When hill-tops are shrouded in mist, this is nearly always a sign of rain, and innumerable old sayings, such as :

"When Cheviot ye see put on his cap,
Of rain ye'll have a wee bit drap,"

tell us that this is very generally known.

One other old weather-lore saying is well worth quoting here, for it shows that the rhyme must have been based on both accurate and long-continued observation:

"Mists dispersing on the plain
Scatter away the clouds and rain;
But when they rise to the mountain tops,
They'll soon descend in copious drops."

In bringing this article to a close the writer hopes that even if he has not imbued the reader with enthusiasm for the study of cloud-land, he will nevertheless have wakened in him an interest to observe more closely the sky overhead. Many a half-hour can be pleasantly spent by watching the happenings in the upper air, and the more familiar one becomes with such the more one is fascinated and drawn to make a closer study of them.

"Thus when the changeful temper of the skies,
The rare condenses, the dense rarifies,
New motions on the altered air imprest
New images and passions fill the breast;
Then the glad birds in tender concert join,
Then croaks the exulting rook, and sport the
lusty kine." *Virgil's "Georgics."*

WILLIAM J. S. LOCKYER.

MAMMATO- OR FESTOONED-CUMULUS CLOUD.

SHAKESPEARE'S GARDEN, STRATFORD-ON-AVON.
From the Water-Colour Drawing by A. C. Wyatt.

Photograph by Pictorial Agency.

ROSES IN F.-M. VISCOUNT WOLSELEY'S GARDEN.
(*From the Hon. Frances Wolseley's "Gardening for Women"*)

ROSES AND ROSE GARDENS

By H. H. THOMAS

TO write of roses and rose gardens is to write of every garden in every country, for how could a garden *be* a garden without its rose beds and bowers, its arches and arbours, poles, pillars and pergolas? It would be as a flower without fragrance, as a jewel without its setting. There is no flower comparable to the rose in beauty and variety of form, in grace and charm, and — more important still — in adaptation to all sorts of conditions in widely differing gardens. There is not a wall, whether it face north, south, east or west, that may not hide its barrenness beneath a screen of fairest rose blossom, no plot, however small or smoke-begrimed, in which some rose will not flourish. By its indifference to environment, it has become the idol of the people, a flower as deeply loved as it is widely grown. There is no garden so lowly that the rose will leave it unadorned, if (ah! what issues lie upon an "if"!) there be great tenderness in the tending, in the greeting a warm affection whose ardour does not cool as time flies by. For with all its indifference to vulgar show and elaborate display, the rose was never a flower to outstay its welcome. There must be love, deep, lasting love in the gardener's heart if he would coax the queen of flowers to the pinnacle of her greatness. Then other things matter little.

Photograph by F. Mason Good, Winchfield.
ENTRANCE TO ROSE GARDEN, ESHER.

Take a lesson from the roses that throng the hedgerows of our countryside, that climb the forest trees of exotic lands, and see how Nature tends them. First and best of all she gives them fair depth of soil in which the roots may find a happy home, shelter for the tender shoots that thrust their reddening noses through the ground as spring comes round, and finally sunshine for the lissom growths that twine and climb and bear their load of glorious blossom. Can Merrie England show a fairer sight in the leafy month of June than Dog Roses clambering about the wayside hedges, binding them with wreaths of graceful bloom, the slender shoots bending almost to breaking point, as flower and fragrance-laden they sway in the faintest breeze that blows? Surely there is none. The man whose heart-strings are so attuned that they cannot respond to the entrancing beauty of a rose-embowered hedge, must surely have lost all joy of living. A day among the wild roses is a tonic for the mind and brings a glow of gladness to the soul.

How bounteous, how prodigal is the profusion of Nature's own wild flowers! How she cares for them and how they respond! And why? Simply because they are the right flowers in the right place. And why do the masses of common hedgerow Dog Rose appeal to the hearts of every one of us, for the moment touching all that is best in our warped and crooked nature? Because of their naturalness, their simplicity; because in their company we get, for a time, nearer to that ideal towards which, consciously or unconsciously, all of us incline—close to the heart of Nature.

And what of rose gardens? A rose garden should be a home of roses, where, under due restriction, each kind may go its own wild way: only thus is it possible to have a garden of roses. For strange anomaly though it may seem, a rose garden is not necessarily a garden of roses. First of all there should be roses that clamber and climb, that cling with loving clasp, hiding bare walls and barren fences, dead trees and rustic poles beneath a fair canopy of blossom. These are essential to the making of a garden of roses. There must be roses new and roses old, roses common and roses rare, English roses and roses from unfamiliar lands, all growing in friendly rivalry, each striving to surpass the other at blooming-time. But most and best of all there would be fragrant roses, whose scents, commingling in the evening air, transform the garden into a place of real delight,

in which to dream glad dreams, and in moments stolen from the workaday world, feel the enchanting glamour of the land where the roses grow.

> "Everywhere are roses, roses,
> Here a-blow and there a-bud,
> Here in pairs and there in posies,"

should be the gardener's motto, so that at flowering-time the shoots might bend beneath their load of summer snow, and cover the ground with a carpet of flaky blossom as the roses fade.

What great variety is found among roses that climb and creep! From the Japanese rose that makes slender growths, 20 ft. long, in one season to be studded with pink or white flowers the next, to the magnificent crimson of Reine Olga de Wurtemburg that flaunts her queenly petals to the summer sun, there is a vast motley of roses in red and white, pink, crimson and yellow, and shades of those impossible to describe and baffling the artist's brush to portray. Some there are that surpass all others in one magnificent display in full summer time, while others, wiser perhaps in their generation, give less generously of their beauty then, but with equal generosity again in early autumn. An ideal garden of roses possesses both. Among those that give their all at the early flowering, not any are more prodigal than the Crimson Rambler, whose brilliant bloom masses are thrown into bold relief by the setting of bright green leaves, and Dorothy Perkins, which shows a rose pink haze of blossom shimmering against the cerulean blue like a sunset, sun-stained cloud. But, after all, such as these form only the frame to the picture, yet even as the fine effect of a painting depends to some extent upon its frame, so the rose garden, which is influenced in greater degree by its environment, needs to be placed amid harmonious surroundings. There are none more fitting than those formed by roses that clamber and ramble and climb, imbued with the spirit of joyous life.

Within there are roses in bewildering variety, many old-fashioned and some forgotten—Monthly roses, Cabbage roses, York and Lancaster, Moss and Provence, Sweetbriar, Damask, Maiden's Blush, and others now seldom seen. Yet no rose garden worthy of its name can be without them, for none sweeter ever blossomed, and a rose without fragrance is a rose undone. Sooner or later it must fall into irretrievable oblivion.

Photograph by F. Mason Good, Winchfield.

BLUSH RAMBLER.

Fragrance is the very soul of a garden of roses; the breath of its life; wanting in sweet perfume it is an outcast from Flora's realm, without charm and disenchanting. Most delightful time of all and leaves. Gloaming in the garden of roses is counted as one of the supreme joys of days and hours in a garden; there is, perhaps, none comparable to it. It is then that the roses charm as never

MR. TATE'S ROSE GARDEN AT DOWNSIDE, LEATHERHEAD.

in the rose garden is when the shadows lengthen, when evening falls and the still air is heavy with the subtle scents of flowers, with rich aroma from the Cabbage rose (plebeian only in name), full fragrance from the Monthlies and Damask, and the scent, delicate yet distinct above all others, of the Tea rose. Then is the garden of roses a place that conjures dreams with power to solace and please. Is is as though at the whisper of the flowers a fairy wand had worked a magic change; the fragrance-laden air soothes dull care away, the roses' lips are wet with the kiss of dew and gleam like jewels as evening falls to dusk, and the moonbeam's silvered glow lights up the flowers they charmed in the sunlight's glare and glitter.

It is a far cry from the old-fashioned roses of half a century ago to those that depend for their attractiveness on rich colour and perfect form rather than fragrance. Is it possible that the rose gardens of the future shall be bowers of scent and arbours of subtle perfume no more? The gods forbid! Yet many of the new roses of the twentieth century appeal, not by the enchanting scent that has been characteristic of roses and rose gardens from all time, but by their surpassingly beautiful colours and shades of colours, poise and form of petal, perfect to the artificial standard of the florist

Among rose exhibitors such things may pass, but then the gardens of those who grow roses for exhibition are often an example of the truth of the saying that "rose gardens are not necessarily gardens of roses." In the rose rich colour and perfect form can never make up for loss of fragrance. However effectually a scentless mass of bloom may appeal to the eye it awakens no response in the most acute of all senses, the sense of smell. It compels an appreciation that is born of the lips and not of the heart. Alas! for the rose of which this can be

Photograph by F. Mason Good, Winchfield.

"ROSES THAT CLAMBER AND RAMBLE AND CLIMB."

said, it will never play its part in the making of a garden of roses. It may win prizes in the exhibition tent, command praise for its shape and shades of colour, but it cannot give pleasure to those who recognise in the rose the very spirit of fragrance, the emblem of a scented flower. Surely the old roses have taken too deep a hold in our hearts to be compelled to give way to usurpers that would boldly curry favour, wanting in the attribute that has raised the rose to the proud position of queen of flowers. Doubtless, however, there is room for all.

"Times change and we with them." The favourite of yesterday is neglected to-day, and to-morrow forgotten.

We owe one debt of gratitude to the newer roses, a debt so great that possibly it compensates for the loss of fragrance in some of them. The fault of the old-fashioned roses, "grandmother's roses" as they have been called, is that they give such a fleeting display of bloom. For two weeks or three they make the garden gay, and then, alas! it is a long, long, weary wait until summer comes again and the roses bloom anew. The newer roses have changed all this; it is now an easy matter to have roses from May until December. On a warm and cosy wall in the merry month of May the old favourite Gloire de Dijon may be induced to bud and blossom, and a little later Queen Marie Henriette, her petals robed in carmine red, keeps company. The China roses then take up the running, to be followed quickly by an unrivalled pageant throughout the summer months, while autumn's first touch serves but to awaken to fresh beauty many of the newer sorts of Teas and Hybrid Teas. Workers among the flowers have made autumn in the garden far more delightful than ever before—a time to anticipate with joy rather than to view with regret. Now roses form a bridge of blossom over the gulf dividing summer from winter, bringing fragrance to the chill air, rich colour to the dull, wan days. None perhaps is more prolific of autumn bloom than a proved garden favourite, Caroline Testout, whose large, bright pink, shell-like petals kindle a warm glow in the drab and deepening gloom.

How varied are the forms in which roses may be grown. There are standards and half standards, climbing roses, roses that ramble and roses that creep, as well as dwarf or bush roses. Standard roses belong almost to a generation that is past. It would seem as though the secret of their cultivation was disappearing with the gradual passing away of the old English cottage garden, for it is there to-day that one must seek for the finest standard roses. Probably the explanation lies in the fact that the roses which make the best standards, are some of those old-fashioned sorts still exclusively grown in little country gardens. For there are some roses that will and some that will not grow well in standard form. In gardens of more elaborate pretensions all sorts of roses have been grown as standards with the result that many have failed ignominiously, and the standard has fallen into disrepute. Probably, however, cultivation is not altogether to blame, for a gardener alone cannot make a garden. The rose garden must grow slowly under the fostering care of time, that crude effects may be touched to subtle harmonies, gaudy colours to restful tones. There is something about the cottager's roses that compels the acknowledgment of the presence of some strange and satisfying influence. It is a sense of harmony, of subtle association with environment; the flowers have so grown up with the garden as to form an inseparable part of one harmonious whole. The cottager having planted the baby rose leaves it to grow up as the garden grows old, that time may weld them both in a bond of peace.

H. H. Thomas.

HOW TO KNOW THE INSECTS

By JOHN J. WARD, F.E.S.

Author of "Some Nature Biographies," "Peeps into Nature's Ways," etc.
Illustrated from Original Photographs by the Author

THE COMING OF SUMMER

WHEN summer has really arrived, the amateur Nature student, who has been diligently striving to know the insect world, often begins to feel that his task has become a hopeless one, and he is tempted to give up in sheer despair. For some weeks past his insect friends have daily become more numerous. Early in the season there was difficulty in finding specimens; now they are by far too obvious and too numerous. So many and such varied species have appeared that to attempt to learn their ways and to understand them seems beyond possibility. In the hot sunlight their buzzing fills the air; the herbage is crowded with their tiny quaint forms, and it is only necessary to shake the branches of the larger trees to discover that they also harbour great swarms. By the waterside still other forms appear, and a glance into the water will show that even there they are also largely in evidence. These small people of the natural world have, indeed, been so successful in the struggle for existence that they now can hold their own in practically every life-sphere that the earth provides; in fact, they often go further, and so establish themselves over vast tracts of land that even man's dominion there is overthrown, and he is driven away before their onslaught. Seeing, then, how abundant insects are, those who study their ways have to be content with considering a few species only at a time, leaving the many for subsequent investigation.

WHITE ADMIRAL BUTTERFLY.

In the present article, therefore, I am making no attempt to enumerate the vast and varied throngs of beetles, flies, bees, ants, wasps, moths, butterflies, etc., that appear in such abundance during the summer period. Instead, I propose to continue with the developments of some of the insects previously considered and introduce new insects of other types from time to time as these developments are completed.

One of the butterflies shown in its preliminary stages in my last paper has now

completed its development. That quaint, spiny caterpillar which suspended itself to the branch and changed into a chrysalis, has now again assumed a still more wonderful form. It has become a most charming butterfly with velvety brown and white wings above, while their under sides are coloured with delicate blue-greys contrasted with patches of mahogany brown. In the first illustration here, the insect is shown in all the glory of its handsome uniform. It is the White Admiral Butterfly (*Limenitis sibylla*). In this lovely guise the insect will probably spend some two or three weeks of life in the sunlight, swiftly flying along the woodland glades, seeking its mate, and then depositing its eggs about the leaves of honeysuckle bushes, with which operation its career will terminate. From its eggs will come little caterpillars, which feed on honeysuckle leaves until winter approaches, when they hibernate, wrapped in shrunken leaves, until spring. In the early spring they commence to feed again, and quickly develop into the spiny caterpillars that eventually suspend themselves to a branch by their tail-ends, prior to changing into chrysalides, as previously observed.

CATERPILLAR OF THE BRIMSTONE BUTTERFLY PREPARING TO BECOME A CHRYSALIS.

The second butterfly considered in my last paper was then, as we observed, in its caterpillar stage, and was feeding on buckthorn leaves. In the illustration on this page the full-grown caterpillar is shown preparing to become a chrysalis. It will be observed that its method of procedure is quite different from that of the White Admiral Caterpillar. This caterpillar of the Brimstone Butterfly does not hang head downwards, but becomes a chrysalis with its head pointed upwards. The next illustration shows this same caterpillar after it has moulted its skin and evolved into a chrysalis. Notice that the chrysalis is not only attached at its tail-end, but is also supported with a delicate silken girdle round the body. Now these contrasting features are important points in the classification of butterflies, for those butterflies which in their chrysalis stage are suspended by their tails produce butterflies of both sexes with only four perfect legs, the forelegs being rudimentary and of no use in walking; and on these features are based the characteristics of the extensive family of the *Nymphalidæ*, which include Fritil-

CHRYSALIS OF THE BRIMSTONE BUTTERFLY.

laries, Tortoise-shells, Admirals, Peacocks, Ringlets, Meadow-browns, Graylings, and other familiar butterflies. The Brimstone Butterfly belongs to the family known as *Papilionidæ*, in which the butterflies of both sexes possess six perfect legs, and the chrysalis is attached by its tail, but in an upright position, and girdled by a silken thread, as shown in the illustration. This family includes the Common Whites, Orange-tips, Clouded Yellows, Swallow-tails, and the Brimstones, as we have seen. So that by studying the metamorphoses of the White Admiral and Brimstone butterflies we get a clear exposition of the salient characteristics of two of the largest families into which butterflies are grouped.

The chrysalis stage continues for some sixteen or seventeen days before the butterfly is ready to appear. In my next paper I hope to be able to introduce a photograph of it before it enters on its final sphere of life and seeks to conquer space on its pale yellow wings.

We may now look for further development from those cocoons at which we glanced at the end of May. From the cocoons amongst the coarse grasses will shortly emerge Drinker Moths, and these may somewhat astonish the amateur entomologist by their variety of colour. Some are of a tawny brown, while others are almost a golden yellow, and two white spots, one large and one small, appear near the centre of the forewings. The individual insects vary very much in colour, but there is a distinct division into brown and yellow insects, and the brown insects, it should be observed, have large and feathery antennæ, as illustrated in the upper example on this page, which is a photograph of the male moth. Below is the yellow female insect, whose antennæ are comparatively simple in structure. Light has great attraction for these moths, and they may frequently be found on the outskirts of towns fluttering somewhat recklessly around street lamps, often finding their way into the interior of the lamp, where they meet their doom.

Wherein lies the mysterious attraction in artificial light that so fascinates moths and other insects it is difficult to imagine. Undoubtedly the light appeals to some sense of the insects, and often so forcibly as to make them oblivious of everything around them. Some of the larger Hawk-Moths are so reckless in the presence of a bright light that I have frequently seen them plunge at the globe of an electric arc-light with such force that the impact caused a distinctly audible thud and hurled them stunned and helpless to the ground. It is a remarkable fact that while to some moths light seems irresistible, others are never attracted by it. Considered by analogy with our human senses, this attraction seems unaccountable, but I am inclined to think that it must be something akin to that fascination which a large flywheel of an engine exerts,

DRINKER MOTHS.
The upper is the male insect.

SWALLOW-TAIL MOTH.

when revolving, upon some people, or the similar fascination which water continually rippled by wavelets exercises. To the moths our artificial lights may appear as rushing or whirling objects of this nature, which first attract their interest, and then, exerting an ever-increasing allurement, at last become irresistible and draw them into the vortex. Just as there are human beings who can coolly face a rapidly whirling wheel, while others must turn from it or lose control of themselves, so it may be that some insects are quite immune to such fascination while others cannot resist it. This fascination which light exerts for moths is sure to be observed by the amateur naturalist, and he will naturally ask the "Why?" of it. As I have never yet met with any plausible explanation of this phenomenon, I offer the above as a suggestion.

There is no moth that is more likely to be seen visiting the lights than the Swallow-tail, whose stick-like caterpillar and leafy cocoon we have previously considered. In the year 1902 these insects were more than usually abundant, and throughout the month of July of that year the electric arc-lights of the town (Coventry) in which I was living were a sight well worth witnessing. The moths were so abundant as to give the effect of a snowstorm as they fluttered around the lights. The pale primrose yellow of their wings appeared white in the electric light, and their gentle, fluttering flight gave the effect of falling snowflakes; although, of course, flakes of an unusually large size, for their wings sometimes extend two and a half inches. The Swallow-tail is one of the commonest of moths during July. Each female moth deposits

CATERPILLARS OF THE BLACK ARCHES MOTH.

about five hundred eggs, usually amongst the leaves of elder, honeysuckle, or fruit trees; and I need hardly add that each of these eggs, if all goes well, gives birth to a little caterpillar which every day grows more and more stick-like, until its mimicry is as perfect as those examples illustrated in my first paper.

By shaking the branches of oak trees during July some of the curious larvæ shown on p. 130 may be met with. These caterpillars possess conspicuous coloured patches and tubercles bearing tufts of blue and red hairs; in fact, the larvæ appear as a mixture of colours —yellow, red, blue, green, brown, grey, and black. This is the caterpillar of the Black Arches Moth (*Psilura monacha*), and it probably represents an instance of "warning colours," its striking livery indicating to its enemies that it is unpleasant to the taste. There are many instances of larvæ, and even fully developed insects, which develop colours that make them conspicuous, as a means of protection. This method of protection, of course, is a complete contrast to that of the stick-like caterpillars and other insects which mimic their surroundings to escape the eyes of their foes.

DRAGON-FLY.

Now is the time when Dragon-flies begin to be conspicuous, especially the larger kinds. On this page is shown one of the largest and swiftest-flying of these insects amongst British species—a member of the family *Æschnidæ*. A few minutes before I photographed this insect it was hawking for small flies and midges up and down a country lane, keeping more or less to a particular stretch of the lane, and every now and again coming to rest on a branch of blackberries, as shown in the photograph. Probably it was then digesting the mouthful of flies it had captured. The flight of these insects is very powerful; they reverse their direction with remarkable facility, even when travelling at full speed. Their appetite is enormous, and their prey is captured while they and their victims are on the wing. I once saw a Dragon-fly bite quite a large piece from the wings of a White Cabbage Butterfly and immediately munch it up. This may seem an extraordinary occurrence to witness, but it so happened that I and the Dragon-fly were both after the same butterfly, for after striking at the butterfly with my net, I discovered that I had captured a Dragon-fly as well as the butterfly, and also that the Dragon-fly had captured the butterfly.

Their speed of flight, bright colours, and gauzy wings contrast greatly with their earlier stages, when they live as crawling larvæ at the muddy bottom of a pond. These larger species, on account of their powers of flight, often travel to woods and country lanes at long distances from the place of their birth to seek their prey. I have frequently seen them in towns hawking under trees; in fact,

they are such ravenous feeders that they will occasionally enter houses while hunting flies. When this event does happen, and often when it does not, the Dragon-fly may come to grief, for these insects have by some means acquired an evil reputation. In Scotland they are "flying adders"; in some parts of England "horse-stingers"; and in other parts "devil's darning needles"; while in the Midlands they are generally called "hornets" (which are, of course, entirely different insects). Even the name "Dragon-fly" is not an inviting one, and savours of superstition. These insects, however, do not possess a sting, although when captured they brandish the tail-end of their abdomen in a manner that seems to imply mischief. Nevertheless, they are quite harmless; and I need scarcely add that, although they may bite through a butterfly's wings, yet their mouth parts are not sufficiently strong to injure the human skin.

JOHN J. WARD.

HOW TO KNOW THE WILD ANIMALS

By DOUGLAS ENGLISH, B.A., F.R.P.S.
Author of "Wee Tim'rous Beasties," etc.

THE RED-BACKED MEADOW MOUSE

BANK VOLE. RED VOLE. WOOD VOLE.

With Photographs by the Author

I FEEL that I need make no apology for reviving a term so direct, elegant, and descriptive as *Meadow Mouse*, and employing it in preference to a term so uncertain, ugly, and meaningless as *Vole*.

The objections to the latter have been ably summarised by Mr. Lydekker, who has laid especial emphasis on its arbitrary museum origin, and on its complete absence from the vernacular. To these objections I would add the additional one (founded on long experience) that, in the rustic mind, it is invariably and not unnaturally confused with *Mole*.

It has been suggested to me that "Water Vole" in place of "Water Rat" may serve a useful purpose in emphasising the distinction between a harmless, attractive animal, and another animal (the common Rat) whose characteristics are the reverse of harmless and attractive. I must confess, however, that I have never yet heard the term naturally employed in speech, though it may occasionally intrude itself as a learned correction; and I fear that the slayer of rats (an impetuous, choleric man) strikes first and identifies at leisure: "How now! A rat? Dead for a ducat! Dead!"

The addition of the Red-backed Meadow Mouse to the list of British fauna is comparatively recent, and the credit is due to Yarrell, who wrote of it in 1832. That it should not have been recognised previously may be attributed to the scant attention which animals, as opposed to birds, fishes, and insects, have received from British naturalists. This want of interest appears to have been persistent, for it is only within quite recent years that the occurrence of this species in a fresh locality ceased to be ceremoniously recorded in the Natural History papers. There is little doubt that the Red-backed Meadow Mouse is universally distributed throughout Great Britain; and in some parts of the country—I may instance the particular district of West Kent in which I live—it is extremely common. From the fact that its remains have been discovered both in the Caves and in the Norfolk Forest Bed—its teeth can be certainly identified—we may assume that it has been indigenous for an indefinite period.

THE RED-BACKED MEADOW MOUSE.
The side view gives some idea of the approximation to the True Mouse type.

It must be admitted, however, that the Red-backed Meadow Mouse presents a somewhat indeterminate appearance owing to his resemblance, on the one hand to the True Mouse type, and on the other hand to the Meadow Mouse type. In many respects he forms a connecting link between them, and this, no doubt, has frequently led to his confusion with one or the other.

His resemblance to the former (to a Long-tailed Field Mouse, for example) may be seen in his comparatively sharp muzzle, in his outstanding ears, in his estimable length of tail, and in his wiry, clean-cut limbs. His habits accord pretty closely with his appearance. He is a bold, hardy, active Mouse, who shows a decided preference for made ground in the neighbourhood of human habitations, who is prompt to take advantage of winter sunshine, who can climb and jump and run with the best, and who will show his natural audacity by the careless fashion in which he enters a trap, and by the devil-may-care air which he adopts in captivity. I have caught the same individual seventeen times in two days, and he showed no hesitation in leaving the trap for my hand, and jumping to ground from the end of my outstretched arm. I have often released them on to a branch in the hedgerow, in which case they usually perform their toilet, and take a meal off the leaves, before descending to earth. Different individuals show different degrees of boldness; but as a rule, like the Long-tailed Field Mouse, and unlike the Short-tailed Meadow Mouse, they are easily tamed.

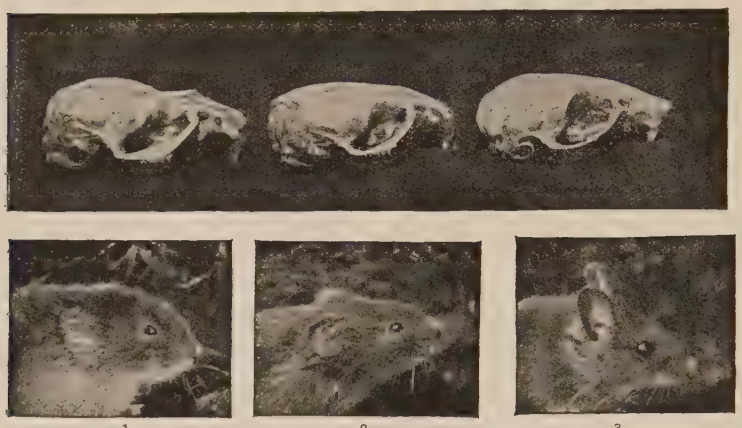
Apart from these external features, there are certain peculiarities of the skull in which the Red-backed Meadow Mouse closely approaches the True Mouse type.

For the proper appreciation of these, and of the influence which they seem to have on his diet, it will be necessary to refer briefly to mouse-skulls in general.

If the reader will pass a finger from the outer corner of his eye towards the opening of his ear, he will feel a ridge of bone which curves out perceptibly from the side of his head. This is called the zygomatic arch. In many animals, owing to the prominence of the face-portion of the head at the expense of the brain-portion, the zygomatic arch forms a remarkable feature of the skull, and when, as is the

THE RED-BACKED MEADOW MOUSE.

case with mice, the hollow of the eye is hardly distinguishable from the hollow of the temple, and both lie back within the circuit of the zygomatic arch, the solidity or otherwise of the latter is of considerable importance in determining, so far as outward inspection can go, the solidity or otherwise of the skull itself.



1 2 3

HEADS OF THE SHORT-TAILED MEADOW MOUSE (1); RED-BACKED MEADOW MOUSE (2); AND LONG-TAILED FIELD MOUSE (3).

The shape of the zygomatic arch is a reliable guide in distinguishing the three species.

In the Long-tailed Field Mouse the zygomatic arch describes a gentle sweeping curve, with no thickening of the middle portion, and but a slight angularity at the hinder end. In the Short-tailed Meadow Mouse the arch presents abrupt, strong-looking angles, and a stout, flattened joint in the centre where two of the bones composing it overlap. In the Red-backed Meadow Mouse there is a midway development both of the joint and of the angularity.

The lower jaws of the three species afford a similar scale of comparison: in the Long-tailed Field Mouse graceful lines, in the Short-tailed Meadow Mouse solid ridges, and in the Red-backed Meadow Mouse a mean between the two.

The teeth of the three correspond with their several settings. It will be convenient to leave the grinding teeth of Meadow Mice, and the extremely beautiful patterns which their grinding surfaces present, for consideration in a subsequent article, and to confine ourselves for the moment to their incisors or cutting teeth.

The incisors (front teeth) of Rodents present such unique characteristics that it is possible to distinguish a member of the order by them alone.

They are large, strong, curving teeth, often of a yellowish or orange colour, which grow continuously during the animal's lifetime. The working part is composed of the usual ivory and enamel; but the enamel, instead of covering the whole exposed portion, is almost if not entirely confined to the outer surface. Owing to its hardness it wears away more slowly than the ivory behind it, and the result is the formation of a chisel edge, and its maintenance in a sharp condition by wear and growth combined.

Both upper and lower incisors grow in regular curves, and, should one be accidentally broken, the opposing tooth, above or below as the case may be, continues its curve, and grows back upon itself, with disastrous and often fatal results to the animal.

The upper incisors being situated in the fixed upper jaw are, of course, immovable. In gnawing, the work is effected mainly by the lower incisors; and the lower jaw, while admitting of movement in several directions, is specially modified for back-and-forward chiselling. To this end the hinder portions of it are lengthened, giving additional scope for the lengthening and contraction of the masseter muscles, which are attached to the fore-parts of the animal's face and do most of the work in pulling the lower jaw forward. Moreover, the portions of the skull to which the lower jaw hinges are grooved to assist a back-and-forward motion.

One would expect to find that teeth which acted as chisels, and in which it was extremely important that the edges should wear evenly, would not admit of any side or cross movement such as would tend to blunt their edges on the edges of the teeth opposed to them.

CHARACTERISTIC ATTITUDES OF THE RED-BACKED MEADOW MOUSE

The bottom left-hand picture shows the Mouse burrowing.

In point of fact, however, the lower jaws and teeth of mice admit of considerable movement, both conjointly from one side to the other of the mouth, and separately, to varying distances from one another. They form a tool of which suppleness is a distinguishing feature. This tool, however, is singularly effective in chiselling all kinds of vegetable matter, and it is possible that its side and cross movements are an advantage to the mouse in dealing with fixed obstacles. It is noticeable in this connection that a wooden cage for rats or mice need not be metal lined throughout. It is only necessary to protect the right-angled junctions of the sides, top, and bottom, for the rat or mouse can get no grip on the flat with his upper incisors, and consequently cannot gnaw it.

1 2 3

LOWER JAWS OF LONG-TAILED FIELD MOUSE (1); RED-BACKED MEADOW MOUSE (2); AND SHORT-TAILED MEADOW MOUSE (3).

There are interesting variations in the form of the lower incisor teeth in the different species of mice. In the Long-tailed Field Mouse we find a tooth thicker (front to back) than it is wide, with a long, hollowed bevel—a carver's chisel, in fact; in the Red-backed Meadow Mouse a slightly wider tooth with similar bevel—a cabinet-maker's chisel; and in the Short-tailed Meadow Mouse a tooth whose width is about equal to its thickness, and whose bevel is short and abrupt—a carpenter's chisel. A long bevel and narrow cutting edge are an advantage in dealing with hard material, owing to the lesser substance of the shaving. It is not surprising, therefore, to find that the Red-backed Meadow Mouse is, like the Long-tailed Field Mouse, a confirmed nut-cracker; and that, where the bark of trees is attacked by mice, it is probably one of these two species which is the culprit.

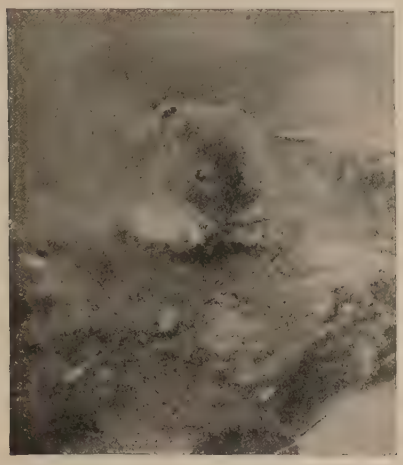
In the spring of 1902 I excavated in a neighbour's orchard the local habitations of two small rodent communities. One was tenanted by Long-tailed Field Mice, the other by Red-backed Meadow Mice. They were situated within fifteen yards of each other, and appeared to be conducted on similar lines. In both cases there were, as far as I could determine in the intricacy of the roots, three entrances. In both cases these entrances terminated in a double compartment, sleeping-room and store, some eighteen inches below ground-level. In both cases the community consisted of five adults, and in both cases the store was entirely composed of cob-nuts. The Field Mice had ninety-eight, the Meadow Mice ninety-three, so tightly packed that it was difficult to dislodge them with the fingers. No doubt this was due to a gradual subsidence of the roof of the burrow, which the mice themselves would be quite capable of remedying. The nuts were intact, and I failed to discover any empty shells either in the burrows themselves or in their vicinity. This looked as if the stores had not yet been drawn upon, for the nuts were of excellent quality; and to those fond of the nuts I would recommend the expedient of maturing them at an even temperature as the mice do.

The presence of such large stores naturally roused my curiosity as to how the nuts were originally collected and handled. Experiments with captive Meadow Mice showed me that at least three methods of transport were employed. Their usual practice is to take the pointed end of the nut between their teeth and to jump along with their heads held high. Sometimes, however, they wedge it between their chin and fore-legs, and sometimes they trundle it before them.

Owing to the all-round effectiveness of his teeth and to his catholic taste in vegetables, the Red-backed Meadow Mouse can make his presence felt.

"Its fur is red as the red chestnut,
And it is blithe and slim;
It leads a life most innocent
Within the forest dim."

So sings the poet; but what sings the gardener? Ninety per cent. of the injury done in plantations and gardens by mice is the joint work of the Long-tailed Field



THE RED-BACKED MEADOW MOUSE CLEANING HIS TAIL.

Mouse and the Red-backed Meadow Mouse.

Both species prefer made ground, both species are prolific, and both species are voracious. It would be idle to attempt to enumerate the plants they have a liking for, and little that they fancy, either above ground or below, will escape them. To reach the first they clamber, to reach the second they burrow or drill. Moreover, being provident little beasts, they guard against contingencies of weather by making stores. Hence the small tell-tale heaps of earth from end to end of the pea-row.

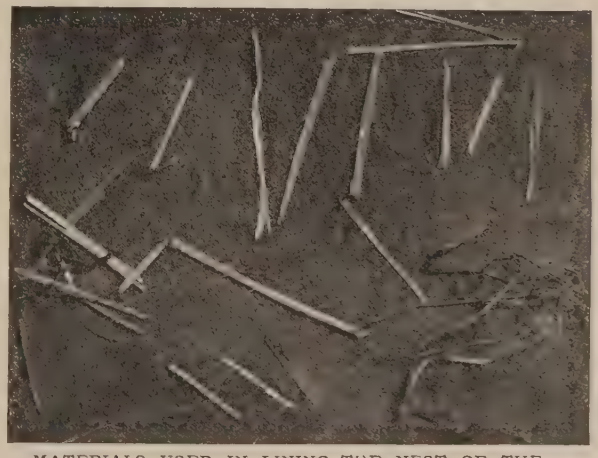
Yet, even from the gardener's point of view, a few points may be urged in their favour. They are persistent consumers of moths, caterpillars, grubs, and snails, and in this respect undoubtedly do him service.

A passage quoted by Millais "from a gardening paper" pretends an even higher claim. It shows how hyacinths may be increased, and runs as follows :—

"The Dutch growers were helped out of the difficulty of rapid reproduction, like the captive lion of fabled history, by a mouse. It was observed that certain hyacinths here and there, instead of blossoming in the ordinary course, made innumerable bulblets — hundreds, indeed — and in a few years these hundreds came to perfection and blossomed with the best. This led to an examination of the bulbs as soon as it was noticed that they were not by way of flowering. The inspection disclosed the fact that the bulbs had been gnawed to the heart by mice. So now the way to increase a valuable hyacinth is to take a knife and slash into its very heart with innumerable crosscuts and plant it in the ordinary way."

I have myself noticed a remarkable increase of snowdrops in a mouse-infected shrubbery, but whether it is due to the kind offices of the mice I have not been able to determine.

In conclusion, some notes as to the colour and size and attitudes of the Red-backed Meadow Mouse may be of interest. "Red-backed" is a good general description, as the upper surface of their coat is a rich chestnut-red in the warm months, and decidedly reddish in winter. It is probable that a high mean annual temperature means a redder, and a low mean annual temperature a greyer coloration; and this appears to be the case with the closely-allied American species, which have been carefully studied. The under surface ranges from cream colour to buff-



MATERIALS USED IN LINING THE NEST OF THE RED-BACKED MEADOW MOUSE.
The grass stems are bitten into short lengths and split in the process.

grey, and sometimes is a fairly pure white. Marked differences in this are also probably due to differences of climate. Immature examples of the species are decidedly less rufous than adults.

The average length all over of a good specimen is about 145 millimetres, while the form peculiar to the island of Skomer, which was first described by Mr. Drane, is some 20 millimetres longer. This increase of size in an island form is remarkable, and has also been noted in some island forms of the Long-tailed Field Mouse.

The pictures give a good idea of several characteristic attitudes of the Red-backed Meadow Mouse. He is capable of standing up on his hind legs, and in this position can make a few ill-balanced hops like the Long-tailed Field Mouse. He can flatten himself and squirm in short grass, or even in loose soil, in such a way that he himself is completely invisible, and his course can only be traced by the movement of what is above him. He burrows with passionate energy, bracing his hind legs against anything that he can reach, and often twisting his body through three-quarters of a circle so that the top of his head points in almost the opposite direction to the top of his tail. In stiff soil he flings fair-sized pellets behind him, but I have not been able to determine whether he cuts these with his teeth and sweeps them back with his fore paws, or employs his fore paws alone.

DOUGLAS ENGLISH.

THE LIFE OF THE SEA-SHORE

By F. MARTIN DUNCAN, F.R.P.S.

Illustrated with Photographs by the Author

THE SEAWEEDS

THERE are few situations more delightful, or so replete with intense interest, as the sea-shore, yet a very small proportion of those who spend their holiday by the sea realise to the fullest extent its many beauties and wonders.

I wonder how many casual visitors, rambling along the sea-shore on a summer afternoon, realise that they are making an excursion through the confines of two kingdoms whose monarchs are for ever striving against each other and encroaching on each other's marches! Yet such is the case, for when we walk along the sea-shore we are travelling along the ever changing frontier line which separates the kingdom of Demeter, Queen of the Earth, from that of Neptune, Lord of the Sea. As we traverse the edge of Demeter's kingdom, keeping a sharp lookout, we soon notice that although many of the inland plants are growing down close to, and even on, the shore, many of our old favourites of the meadow and woodland are absent and their places taken by new kinds—by grasses, reeds and rushes. Of these plants peculiar to the region of the shore and cliffs, is the Yellow-Horned Poppy, with its large golden-yellow flowers and wonderful horn-shaped seed-pods, that measure six to twelve inches in length. The fleshy-leaved, white-flowered Samphire loves the rocks by the sea, and Shakespeare, in "King Lear," has left us a graphic description of the dangers of the Samphire collector, who gathered the plant in those days for medicinal purposes :—

"Half way down
Hangs one that gathers samphire: dreadful trade!
Methinks, he seems no bigger than his head."

There also on the cliffs we may find growing the Wild Cabbage, parent of all domestic cabbages. On the sandy shores grow the Purple Sea-Rocket, the Sea-Kale, Sea-Holly with its beautiful, smooth.

bluish foliage, Sea-Stock, and Scurvy Grasses. These last, together with certain of the reeds and rushes, play an important part in gradually fixing the shifting sands. Other plants peculiar

The most familiar of all the seaweeds are the great masses of Wrack or Fucus, which clothe the rocks from high to low water mark. Although so common, the Wracks are really very interesting, and

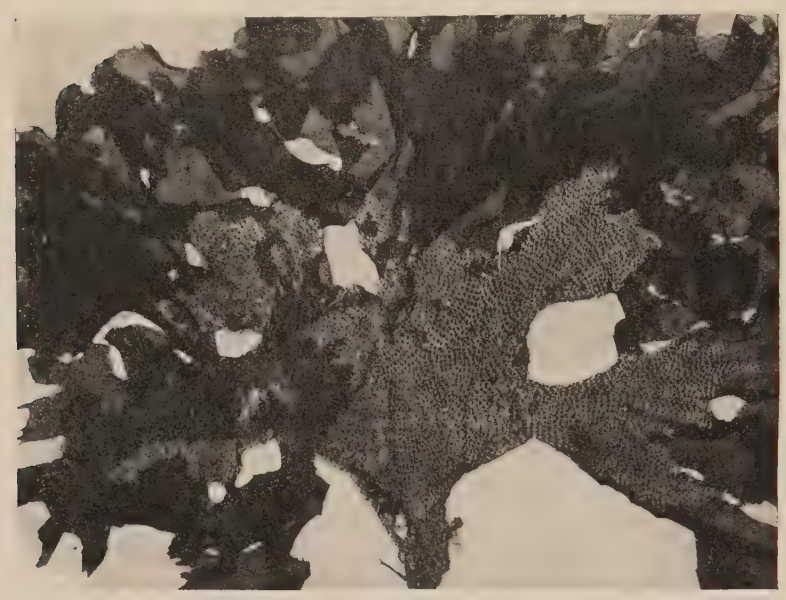
"THE BORDERLAND OF NEPTUNE'S KINGDOM."

to this borderland of Demeter's kingdom are the Sea-Beet, four kinds of Sea-Lavender, the Sea-Spurrey, Sandwort, and the Tamarisk, which grows so close to the waves on many parts of the Essex and Sussex coasts. Many of these plants show striking modifications, adaptative to their peculiar environment, and are, therefore, worthy of a little close observation.

Down on the borderland of Neptune's kingdom, how different are the forms of plant life! Here we find innumerable seaweeds, which clothe the rocks and shore, varying in colour through all sorts of beautiful shades of green, brown, red, and purple. And not only beautiful of hue, but exquisite of shape, are these plants of Neptune's garden.

are always worth turning over carefully, for many marine treasures lurk amongst those tangled masses, such as small and delicate seaweeds, minute shell-fish, etc. This common weed has many popular names, such as Bladder-Weed, Kelp, Black Tang, and "Our Lady's Wrack." All round the English and Scotch coasts it is collected and used by the farmers for manure for their fields. The Irish peasants use it for their potato fields, and in Jersey and Guernsey, so valuable is it for agricultural purposes, there are special seasons regulated by law for the cutting and collecting of the "Vraic," as it is called. Altogether, there are four different kinds of Wrack to be found on the shore—the Knobbed Wrack, sometimes called "Sow-whistle," the Bladder Wrack, the

Serrated Wrack, and the Channelled Wrack. The Bladder Wrack has fronds from one to three feet long, according to the situation in which it is growing, the bladders are in pairs, and the fruit pods (receptacles) also grow in pairs at the ends of the fronds, and are often heart-shaped. The Knobbed Wrack has



SEAWEED PARTIALLY COVERED WITH A GROWTH OF BRYOZOA.
(A colony of Moss-animals.)

not quite such broad fronds but much larger bladders; indeed, the fisher lads sometimes dry them and fashion them into whistles. The Serrated Wrack has no bladders, but the edges of the fronds are toothed or serrated. The fronds of this Wrack are frequently partly covered with a delicate whitish tracery, each tiny mesh representing what was once the home of a very beautiful and interesting little creature called a "Moss-animal," or Bryozoon. The Channelled Wrack grows chiefly near high-water mark, seldom below half tide, for it seems to require exposure to the air for many hours every day. Growing in thick tufts from three to six inches in length, destitute of air bladders, and with a furrow in its stem, it is easily recognised.

Although the seaweeds are so numerous and such familiar objects of the sea-shore, yet very few of them have popular names. It is, therefore, practically impossible to write about them without giving them their scientific names, for the scientist has been more eager to examine minutely, and name, each individual weed than has his lay brother. As we stand on the edge of a breakwater, and look down into the water, we shall see that some of the wooden piles have a wonderful growth of beautiful green tubular-shaped weeds upon them. This is known as the *Enteromorpha intestinalis*, which really means "in the form of an intestine," and the weed varies in length and breadth from short, narrow fronds, to tubular ribbons quite two feet long. But it is in the rock pools that we see the seaweeds in all their glory, and according to the situation of each pool on the shore, so we shall find it to contain certain species of seaweeds. In the pools nearest high-water mark, we shall find the Wracks predominating, with the *Enteromorpha*, and a delicate, soft, green growth called *Conferva*, and a deep green weed which the fishermen call "Oyster-green."

In the pools at about half-tide mark, we shall find many beautiful and delicate weeds, with dainty, thread-like, many-branched filaments. One of these, to be found in all tidal pools, is the Red Ceramium, which in its finest condition is a delicate rosy red, its filaments forked at the ends with the joints more or less transparent. The beautiful violet *Polysiphonia* is another denizen of the half-tide pools, growing from about six to

THE LAURENTIA.

ten inches in length, with a main stem or trunk and a multitude of smaller branches, like a miniature tree. On the shady side of the pool, growing from three to six inches in length, with slightly-forked branches of a fine deep crimson colour, is the *Griffithsia*, named after Mrs. Griffiths, who has discovered and described so many of our native seaweeds. If we take a specimen home, and throw it into fresh water, the membrane will burst with a crackling noise, and the beautiful colour be discharged.

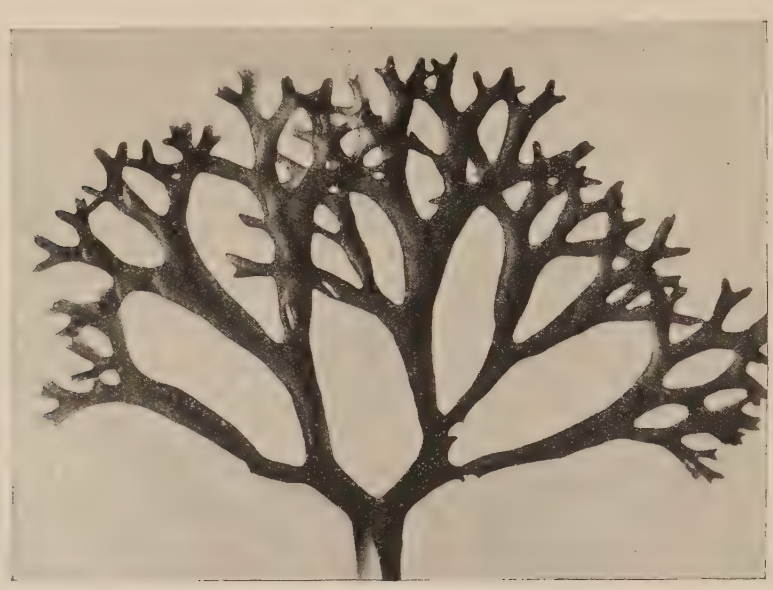
The *Laurentia*, named after the French naturalist, M. de la Lauriencia, is a rather interesting weed with a wide shore distribution from extreme high-water mark to beyond low-water mark. It has a flattish frond, and undivided main stem, from which grow out stout branches alternately clothed with lesser branches. This weed has rather a hot, biting taste, and was formerly eaten in Scotland, where it was known as "pepper dulse."

Masses of stony-looking, white-jointed twigs are often very abundant in pools at the base of the limestone cliffs. This growth is the so-called Coralline, which has nothing to do with the corals, as its name seems to imply, but is really a curious seaweed with an outer coating of carbonate of lime. The plant secretes this stony covering as it grows, the vegetable tissues forming a slender stem within. If a dried tuft be held in a flame, it will be seen to burn with a fine white light. By placing a specimen in weak acid, the lime will be dissolved, so that the structure of the plant can be seen.

One of the treasures of the half-tide pools is the Peacock's-tail Seaweed. It is a most remarkable-looking, fan-shaped weed, with graceful fronds expanding in almost perfect half

THE ENTEROMORPHA.

circles. The fronds are striped across, the colours varying through shades of orange and olive green, with a little red.



THE CARRAGEEN, OR IRISH MOSS WEED.

It is a weed well worth seeking, and is the northern representative of an abundant tropical seaweed.

Another remarkable weed is known as Carrageen, or Irish Moss. In shape it somewhat resembles a crumpled fern frond, varying in colour from a yellowish green to a livid purple or olive brown. At one time a fashionable remedy for consumption, it was collected by the peasantry of the west coast of Ireland, and whilst in repute sold for as much as half-a-crown a pound. The Winged Delesseria is a beautiful, and in some places abundant, weed, which spreads out a mass of exquisite rich red fronds, and is one of the delights of the collector. Another of the most beautiful and at the same time abundant of our seaweeds, is the *Plocamium*, the Braided-hair weed. It grows in perfection in the deep low-tide pools, in delicately fine, much-branched masses of a lovely pinkish red colour, and is also frequently cast up in great quantities after a storm. The great, dark, olive-coloured, ribbon-shaped, wavy-edged weeds, with tough stalks and curious-looking roots, so often cast up by the waves after a violent storm, are called the Tangles, and form wonderful forests of weed beyond low-tide mark, forming a home for all sorts of fish and curious marine creatures. One of these Tangles, the *Laminaria digitata* of the botanist, is collected as kelp for the manufacture of iodine.

What more pleasing memento of a happy holiday spent by the sea than a collection of these beautifully coloured, graceful-shaped seaweeds! And such a collection may be very easily formed. All that is wanted are some sheets of drawing paper cut into convenient sizes, a couple of quires of white, absorbent, botanical paper, a few needles mounted in wooden paint-brush handles, a pair of fine pointed scissors, and one or two camel-hair pencils. A cheap and efficient press may be made out of two pieces of half-inch deal board about two feet long and one foot wide, and a double rug-strap. Having brought home some seaweeds, get a couple of soup-plates and some clean cold water. In one soup-plate cleanse each piece of weed, and then float it out in the second plate on to a piece of the drawing paper supported by your left hand, whilst with your right hand you work with the needles and

brushes to arrange the fronds, thinning out the superabundant branches with the scissors. When the seaweed is arranged to your satisfaction, cautiously raise the paper out of the water, taking care that the position of the seaweed is not altered, and drain off the water. In drying, it is advisable to place a piece of old linen or muslin on top of the mounted weed, to prevent its sticking to the upper paper, and both muslin and blotting paper must be changed at least twice during the drying process. To anyone possessing a student's microscope, the seaweeds and their fruiting organs offer a rich field of beautiful and intensely interesting objects. The space at my disposal, however, will not admit of my describing in detail this interesting subject; I must therefore refer those of my readers who think they would like to take it up, to the chapters on Seaweeds in my book on "Denizens of the Deep."

In looking for the seaweeds, we are sure to see and collect numerous feathery, slender objects, mostly of a brownish hue, and rather horny to the touch. At first sight they might very easily be mistaken for seaweeds, and indeed for a long while they were classed amongst the plants by the early naturalists, their true nature not being thoroughly understood until the microscope became a more perfect instrument, and people began to study the living organism instead of the dead specimens cast up by the tide. Then, however, their real character was soon realised, and they were placed in the Animal kingdom. These graceful, horny-textured objects are really deserted villages, once the home of an active and wonderful animal colony. Careful research in the rock pools will often reveal one of these colonies in the full vigour of healthy active life. Then it will be seen that all along the sides of the stems, tiny, delicately tinted heads, each with a little circlet of feelers, are protruded, making the whole resemble an exquisite miniature garland. It is from their resemblance to a minute spray of flowers that these creatures have gained their popular name of Garland Polypes; their scientific name is the *Compound Hydrozoa.* Some of them live on the rocks in the tidal pools, and below low-water mark, forming a dense growth of fair size; others grow as minute single sprays upon the seaweeds, and on the wooden piles of the breakwaters, or upon the whelk

THE DELESSERIA.

shells which the hermit crabs use as their homes. They are really very wonderful and interesting little creatures, these Garland Polypes, and the life-history of a large number of them is very remarkable. There is a minute form to be found growing as a single polype upon the rocks in the tidal pools, which is called the *Hydra tuba*, and looks during the winter months something like a tiny urn with a circlet of feelers or tentacles. As the season advances the little tubular body may be seen to lengthen, and to have a series of waist-like constrictions. Soon the portions of the body between the waists become marked with eight lobes, and look rather like a tiny pile of saucers placed one on top of another. Next some feelers grow out round the edge of the bottom saucer, and then all the upper saucers break off, separate, turn upside down, and swim away, tiny, umbrella-like things, as baby Jelly-fishes. All through the summer months may be seen the fragile Jelly-fishes moving leisurely in the sea, but with the approach of autumn they produce young, which settle down upon the rocks and grow into *Hydra tuba*.

THE PLOCAMIUM OR BRAIDED-HAIR WEED.

While the little Jelly-fishes are produced simply by the division of the body of the *Hydra tuba*, a purely non-sexual process of reproduction, the sexes are distinct in the Jelly-fishes themselves, so that their offspring, the *Hydra tuba*, is the result of sexual union. This wonderful life-history of a sexless individual giving rise to male and female creatures, which in turn reproduce the sexless form, is called an alternation of generations, and is one of the most remarkable phenomena of Nature.

We have already noticed the delicate tracery of the cells of one of the colonies of Moss-animals (*Bryczoa*), partially covering some of our specimens of the Wrack weeds, and on looking over our gatherings we are pretty sure to find that we have picked up one or two specimens consisting of handsome frond-like masses, that appear as if their whole surface had been most carefully and evenly pricked with a pin. These are specimens of the *Flustra*, or Sea-mat Bryozoa, and each of those pin-holes represents a tiny dwelling, wherein once lived a little Moss-animal, and when all the members of the colony were alive, and each thrust out its tiny feeler-clad head, then the *Flustra* indeed looked as if covered with a growth of moss. There are many species of these Moss-animals to be found along the shore and in the tidal pools, some of which closely resemble the Garland Polype colonies in appearance, and are well worth collecting for their graceful forms alone.

F. Martin Duncan.

HOW TO KNOW THE BIRDS

By the REV. MAURICE C. H. BIRD, M.A., M.B.O.U.

With Photographs by
RICHARD AND CHERRY KEARTON

THE FINCHES

THE Finch family—more numerous in species than any other—are remarkable for the short and powerful structure of their beaks, which, when closed, form a stout cone, well adapted for cracking hard-shelled seeds. The resident pale brown Corn Bunting and the winter visiting brown and white flecked Snow Bunting, both members of the Finch family, have an additional special beak development, in the shape of a hard bony knob on the palate. The latter bird retains the Lark and Pipit-like straight hind claw, which may act as a tiny snow-shoe, and the white patches in its plumage—though strikingly conspicuous at times—may serve a protective purpose when the ground is snow-clad.

The Snow Bunting is a regular winter visitor to our coastline—sometimes in large flocks, but its numbers and frequency greatly depend upon the severity of the weather. Continued hard weather will drive them inland to seek food upon the stubbles—a happy hunting ground where Finches and Buntings do incalculable good by devouring noxious weed-seeds. The whitest example of the Snow Bunting that I have seen was shot whilst feeding, with a mixed assembly of other small birds, upon the refuse left from a threshed-out wheat-stack. During hard weather a stack-yard becomes a splendid "study" for the ornithologist, for as great a variety of bird-life follows the threshing machine as follows the plough at any season of the year, and a newly-mown field, marsh, or lawn has a similar attraction in summer for both grain and insect feeders. Many birds, too, accompany grazing cattle—Wagtails and Starlings especially—to feast upon the

CORN BUNTING'S NEST.

YELLOW HAMMER'S NEST.

MALE CHAFFINCH AT NEST CONTAINING YOUNG.

YOUNG CHAFFINCHES.

worms pressed out of the ground by the footsteps of the cattle, and the insects attracted by their bodies and their droppings. I add such remarks as these because they bear upon our subject "How to know the Birds," by enabling us to anticipate what species we may expect to come across at certain times and under certain circumstances.

Our local Norfolk name of "Thick-headed Lark" for the Common or Corn Bunting, the largest and most soberly clad of its species, may give an inkling as to the derivation of the word "Bunting." For this family are not only Lark-like in size—the Corn Bunting is so in plumage also—but with their less sharply pointed beaks and less delicately elongated bodies, they carry their heads more closely tucked into their shoulders, which gives them a comparatively "bunted," or stunted appearance. Though the alternate name of Corn Bunting would suggest a resident of arable land pure and simple, this bird not infrequently breeds on the confines of marsh-land. Like the Lark, it is very fond of a dust bath, and may, therefore, often be noticed on roadside fences; and where telegraph wires are present it, together with Yellow Hammer and Stonechat, frequently avails itself of them as a perch from whence to pour forth its reiterated and unmelodious song, which Mr. Dixon has aptly rendered by the words "See-see-see-I-I—I'm-he-r-r-re." Like the other Buntings, it is somewhat sedentary in summer, and seldom strays far from its nest, which is built on the ground. Typical of the species also are the eggs of the Corn Bunting, which are streaked with clearly defined black markings upon a more or less pale lilac ground—for this reason the name of "Writing Lark" or "Scribbling Finch" has been given to both the Corn and Yellow Buntings. The short and apparently laboured flight of the Corn Bunting is distinctive in that the legs are carried dangling down below the body, and not stretched out straight behind, or gathered up into the breast feathers, as is the general rule.

The well-known and far more widely distributed Yellow Hammer better deserves the title of Common Bunting; its abstemious and economical song about "a little bit o' bread and no cheese"—with much stress upon the latter item—is familiar throughout the country, and its presence may as surely be expected where the golden gorse grows, as the Yellow Wagtail may certainly be looked for where the same-hued Marsh Marigold, and later on the Yellow Iris, abound. However monotonous the Yellow Hammer's song may be, it is especially welcome when we hear it in early spring before the regular migrant songsters have arrived,

and again in early autumn long after they have departed, or, at any rate, ceased to sing. The late song of the "Guler" is accounted for by the fact that it is double-brooded. August is the most silent month of the year so far as the music of the birds is concerned, but the Yellow Hammer still persists, and on Aug. 27th, 1903, I found eggs still unhatched. Three seems to be the common complement, especially of the later clutches.

Not to be confounded with the Yellow Hammer is the Cirl Bunting, a bird which is of far more restricted range, and chiefly to be found in the south of England. The male of this species has the chin, cheeks, and throat black in the breeding plumage; otherwise it is, to all appearances, a rather small and shy Yellow Hammer, and is, perhaps, rather more a bird of the trees than of the fences. In both species the females are less highly coloured than the males, and in winter both sexes are rendered less conspicuous by brown feather tips, which subdue the bright canary yellow of their heads and under parts.

The Reed Bunting is not restricted to reed beds, for wherever there is a piece of water of any extent supporting rank vegetation around it — be it sedge swamp or osier ground— there the resident Reed Sparrow may be looked for. The male is not very strikingly arrayed, but his black cap and throat, relieved by white-splashed cheeks, and his two white-webbed tail feathers, conspicuous in flight as he flits from one spray to another, are pretty sure to attract attention, if his "tscheeing" call-note cannot be heard. Should his ground-placed nest be discovered, and his more Sparrow-like mate be incubating her typical Bunting eggs (but more darkly grounded and less finely scribbled than those of the Yellow Hammer), he will strive to attract attention to himself by his cries, whilst she will indulge, perhaps, in the well-known Partridge-like device of fluttering helplessness.

One of the first signs of real spring is the sprightly song of the gay Cock Chaffinch, the Bachelor Finch of Linnæus, who first observed, or at least first recorded, the autumnal separation of its sexes. The metallic call-note of the male has given it, in many countries, the sobriquet of "Spink," a name which will surely serve to identify one of the

FEMALE CHAFFINCH AT NEST.

most beautiful of our birds at a distance, when its rosy pink breast, black forehead, blue grey crown and nape with yellow green back, and two white wing-bars, cannot be seen. It has been said

A COCK SPARROW.

that the Wagtail is the smallest bird that walks—for most small birds hop—but if carefully watched, the Chaffinch will also be noticed to use the apparently more comfortable mode of progression. With the exception of the Scotch fir, evergreens are seldom selected as a site for what may be considered the most beautiful of British bird-nests; indeed, only those of the Golden Crested Wren, Long-tailed Tit, and perhaps the Lesser Redpole, can compare with it.

In winter dress, with colours more subdued, the Chaffinch might be confounded with the Brambling, a northern migrant which sometimes comes South in numbers during the winter months, consorts with Chaffinches in the fields and woods by day, and roosts with them in the shrubberies at night. The Brambling, however, is a slightly larger bird, and shows no pink or green shade in his feathering, the prevailing hues of which are black and brown and tawny yellow, with a conspicuous white rump when in flight. In the dead season beech mast is as attractive to both these birds as acorns are to Wood Pigeon and Wild Duck.

The smaller and more shy and delicately shaped Tree Sparrow is nowhere nearly so abundant as the cheeky and maligned House Sparrow, but from its similarity to the latter, it is, perhaps, frequently overlooked. It seems to be extending its range, and is most likely to be met with in winter when its ranks here are recruited by migrants from abroad. It is to be distinguished from its more persistent relative by the fact that both sexes are similar in plumage; the head of each is chestnut brown, there are two white wing-bars instead of one, and there is a conspicuous patch of black on the side of the cheek, surrounded by white feathers, the latter almost encircling the neck. Scarcely any nesting site comes amiss to the House Sparrow; it builds both a clumsy, independent nest in the branches of tall trees, or upon those trained on a wall; in holes of trees; or walls, or thatch, under tiles, in gutter-pipes, in House Martins' nests; under those of the Rook, and even amidst a colony of Sand Martins. The Tree Sparrow, however, never utilises an open site, but always selects a hole, either in some hollow tree—a pollarded Willow frequently—in outside brickwork or stone wall, or, as on the house in which I write, in old and closely clipped ivy where the accumulated growth of closely interwoven stems extend some six or eight inches deep from the wall. Ivy-clad buildings of any age are a great attraction to birds—in spring for nesting, and in winter for roosting purposes. In and on the ivy-clad ruins of East Somerton church I have found the eggs of Kestrel and Sparrow Hawk, Barn Owl, Jackdaw, Starling, Thrush, Blackbird, Flycatcher, Robin, Wagtail, Cuckoo, Pigeon, Hedge Sparrow, Wren,

GREENFINCH.

GREENFINCH'S NEST.

HAWFINCH'S NEST.

Greenfinch and Chaffinch, besides House and Tree Sparrow. Pheasants frequently nested at the base of its walls, and, doubtless, had not the local race of Stock Doves been accustomed to make use of the sand-hill rabbit burrows, they, too, would have resorted to the ivy-mantled tower for nesting.

The chief characteristic of the Greenfinch is its greenish yellow body colour, which passes in the male into bright yellow on the margins of its flight feathers and at the base of the tail; both of these points are shown off whilst the bird is either flying or courting. The monotonous song, if such it can be called, is equally distinctive, as is also the oft-uttered call-note — "maree —maree." The Greenfinch is one of the commonest birds of garden shrubberies, and almost as destructive to vegetating garden seeds—especially those of the cabbage tribe—as the Chaffinch.

LINNET'S NEST.

The Hawfinch—another bird that has so extended its range within the past twenty years that it is, though still somewhat local, no longer to be looked upon as one of our rarer birds—is somewhat Bunting-like in shape; its very heavy beak, short neck and tail, give it a very lumpy appearance. It haunts the outskirts of woods (neither birds nor insects seem partial to the central parts of large woods) and shrubberies, and although its beak is well adapted for cracking hard-stoned fruit, it is very partial to garden peas. Though a naturally shy bird, it is very difficult to scare away when once it has begun upon a well-podded row; it takes itself off upon the slightest alarm only to return as soon as danger—in the shape of the gardener—disappears. Jays and House Sparrows also sometimes play havoc with this toothsome esculent. The latter bird's presence amongst the pea-sticks may, however, be occasionally excused, because it preys upon both Weevils and Pea Moth—the prime cause of maggoty peas! No such excuse, however, can be made for the Hawfinch, whose chief recommendation lies in the sober quaintness of his appearance, and the delicate fawn-coloured body plumage, which on the under parts is tinged with a faint suspicion of lilac. He has a black bib, and a black line encircles his lead-coloured beak and eye, the iris of which is greyish white. Another peculiarity is that the fifth to the ninth blue-black flight feathers are re-curved like the point of a bill-hook. The short, black tail fades to grey at the tip. In autumn the Hawfinch is as fond of the seed of the crimson-pulped yew berries as are the Thrush family of the pulp itself.

The Goldfinch, beloved of cage-bird fanciers, has greatly decreased in numbers of later years. It is particularly a bird of the old-fashioned orchards, and delights in lichen-infested apple trees for nesting purposes, and in derelict thistle-covered land as a winter feeding resort. Where the knapweeds abound, too, Goldfinches may also be looked for, as the seed of these plants, especially of *Centaurea*

nigra, or "Hard-head," is much beloved by them; it ripens late, is held long by the plant, and stands up well above the average level of any English snow-fall. The golden-coloured wing patch, from which the Goldfinch derives its specific name, is well displayed whilst it is hanging on to, and extracting the seed from, the swaying tops of either of these weeds, and the bright, blood-red forehead and throat, black nape and white cheeks and under parts, may then be observed. So, too, the white-tipped tail and flight feathers are conspicuous as with cheery call-note this sprightly bird flits from one feeding plant to another.

Siskins are best known as cage birds, not perhaps on account of their rarity, but because, generally speaking, they only visit us in flocks in winter, and then confine themselves to plantations of larch and fir, birch and alder. The seeds of the two last-named trees are most esteemed by them. Siskins are very active and Tit-like in their attitudes whilst extracting seed from the pensile catkins. In captivity they soon become exceedingly tame, and readily hybridise with the Canary, to which, indeed, they are nearly related. The female is not unlike a small Green Canary with a short and deeply notched tail, but the male bird has a black crown and bib.

The Linnet, Twite and Lesser Redpole have this much in common—all three are small brown birds, and small in the order they are mentioned; the sexes are similar except that the females have no red on head, breast or rump. Adult male Linnets (sometimes called Brown or Grey Linnets to distinguish them from the Greenfinch or Green Linnet) have the forehead and breast crimson pink, fading off to white on the under parts. The Twite or Mountain Linnet (so called from its breeding haunts, for it descends to the lowlands in autumn) has no red on forehead or breast, but the rump is rosy, and the beak is yellow instead of horn-coloured as in the two other species. All three are gregarious in winter. The Lesser Redpole has the winter habits of the Siskin, and consorts with it in feeding upon alder and birch seed. The latter tree is frequently chosen to receive the beautifully-woven little nest, which is cosily lined with cotton down from the catkins of poplar, sallow, or willow. In addition to the smaller size of the bird, it is to be distinguished from both of the foregoing by a double white wing-bar and the presence of a black patch on the throat, while the rump is a dull white.

Conspicuous amongst the Finches on account of the strong, compressed beak, jet black crown, flight, and tail feathers—contrasting strongly with snow-white rump—the Bullfinch is well known in all well-wooded districts. The male only has the lovely carmine breast, and the black cap is not developed in either sex until after the first moult. In winter, pairs, and sometimes family parties, pay unwelcome visits to gardens and orchards for the purpose of feeding upon the buds of fruit trees—especially those of stone fruit; but pears, gooseberries, and currants are all attacked. The House Sparrow is perhaps a worse and more usual offender in the case of the two last-named bushes, and Tits sometimes attack the blossom buds of various fruit trees, but only in search of hidden insects, their minute eggs or larvæ. No such extenuating circumstances, however, can be pleaded on behalf of the Bullfinch, which when it dissects the damson buds does so merely for the purpose of devouring the tender vegetation which they contain. So rapid are they in their destructive work, that unless there be several trees together for them to act the part of Nature's pruners upon, the chances are that they will have "been and gone and done it" ere the damage is discovered. They are very shy and secretive in their movements, their rather mournful, piping call-note, or the conspicuous white rump, being the items most likely to attract attention to their presence.

When once an orchard is attacked by Bullfinches they are difficult to scare away, and are loth to depart even when frightened by the human voice, retreating one by one a little way, only to return as soon as danger disappears. Should a family party suddenly be surprised in the act of despoiling the trees, the bird nearest to the disturber will immediately throw himself away from his work, bound through the branches, and at once be

MALE BULLFINCH AND YOUNG.

followed by his guilty comrades in single file; but they will only retire about a stone's throw ere settling down to await the departure of their enemy. Should they be pursued still further, the same tactics will be repeated with dipping flight, until they either double back, or, having gained the boundary fence, will challenge the pursuer to a game of hide and seek upon the further side. So invariably do they resort to such methods of retreat that it is quite a distinctive mark of the species, but if their whispered pipe-call be not heard meanwhile, the conspicuous white back is sure to attract attention as Bully flees away. For nesting purposes a thick thorn fence is usually selected, especially one draped with depending brambles; the nest itself being somewhat like that of the Greenfinch, but with a stronger surrounding and more decided platform of small dead sticks and roots supporting it. The eggs, too, are of the Greenfinch type, but not quite so elongated, and the darker markings, upon a bluer ground, are more nearly confined to a zone at the larger end.

It seems a pity to pass over the adroit Crossbill, which, however, is doubtfully cosmopolitan enough to deserve mention in a list of the commoner British birds. Its singularly distorted beak is a very beautiful example of adapted structure, and the birds themselves are so tame that if one does happen to come across a little flock feasting in winter upon larch or Scotch fir cones, their unique method of utilising the half-opened beak as a double lever for prising open the cone valves, in order to secure the resinous seeds, may easily be watched by a patient observer. Of strong build, and with short neck and tail, and powerful feet, they are in shape somewhat like a small Hawfinch, though their antics and plumage — dull green, variegated according to age and sex, with orange and red—are more Parrot-like.

MAURICE C. H. BIRD.

BULLFINCH ON NEST.

FOXGLOVES.

From the Water-Colour Drawing by Mrs. Allingham, R.W.S.

HOW TO KNOW THE TREES GROWING IN BRITAIN

With Notes, descriptive and photographic, for their Identification in all Seasons of the Year

By HENRY IRVING

THE BIRCH AND THE HORNBEAM

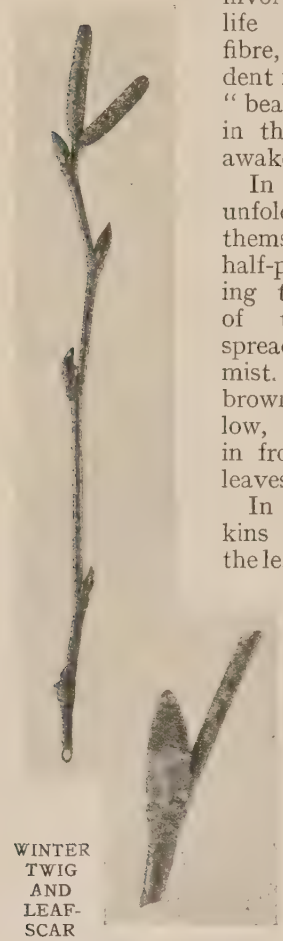
THE slender grace of the Silver Birch impresses everyone. Few of our trees are so well loved. Coleridge's descriptive title "Lady of the Woods" meets with instant approval. Yet, perhaps, the limiting word of that description scarcely holds. If the "Lady" Birch loves the woods she loves the open daylight better. Left to her own devices she will be found more often fringing the forest, where are free air and sunshine, than languishing within its confined shadows. For, indeed, the Birch loves most the open spaces, breezy uplands amongst the bracken and heather, even the higher mountain slopes whither the Scots Pine will scarcely venture. That slender grace of the "Lady" Birch is associated with a splendid hardihood, and power of adaptation, unattained by sterner-seeming trees. Loving thus the open air and the unshaded light, the Birch is, by these, nurtured to the utmost refinement of enduring tenderness.

TRUNK AND BARK OF COMMON BIRCH

We have in Britain two chief varieties of Birch, which amongst other distinctions may be most readily recognised by the habit of their terminal twigs. The one, the Common Birch, has these spreading, or erect; the other, the White Birch, has them drooping, and sometimes in long festoons.

In *winter* the slender grace of the Birch is perhaps most apparent. Its darker twigs gleam in the sunshine, giving emphasis to the clear white of the central stem. Seen, as these trees often may be, marking the margin of a Pinewood, they spread there a subdued light which, like atmospheric haze, softens the dark masses of the trees behind. But it is when seen against the sky, with a depth of unbroken blue or rounded mass of sun-lighted cumulus cloud for background, that the

'ndividual grace of this tree most appears. Then the rich tracery of its curved branchings is fully revealed in glistening bronze—outflowing, tapering to utmost fineness, intermingled but never involved, tingling with life to the farthest fibre, scarcely less evident in this its winter's "beauty" sleep than in the coming spring's awakening.



WINTER TWIG AND LEAF-SCAR (ENLARGED) OF THE BIRCH

In *spring* the newly unfolded leaves spread themselves out, or droop half-pendulous, according to the inclination of the twigs, overspreading like a green mist. Crowds of catkins, brown changing to yellow, hang and quiver in front of the dainty leaves.

In *summer* the catkins have disappeared, the leaves have darkened in colour on the upper surface and have become more tremulous, moving with the slightest breath of wind so lightly poised are they, scattering scintillations of light.

George Meredith in "The Egoist" gives the following word-picture of the tree which is inimitable in its beauty and descriptive fulness: "See the Silver Birch in a breeze; here it swells, there it scatters, and it is puffed to a round, and it streams like a pennon, and now gives the glimpse and shine of the white stem's line within, now hurries over it, denying that it was visible, with a chatter along the sweeping folds, while still the white peeps through."

In *autumn* the tree again shows crowds of catkins, more hidden away among the leaves than were those of spring. These are fruit-catkins ranged along the twigs, pendulous, ripening to dryness among the yellowing leaves which they outlast, remaining more or less the winter through.

The distinctive *bark* of the Birch is thin and silver white, with thin dark lines running transversely, and occasional rough dark patches. Flakes of this bark are shed from time to time, peeling off like paper in the direction of the transverse lines, so new bark, like finest woven silk, is constantly exposed, and the silvery whiteness is maintained from year to year. But in some trees the silvery whiteness gives place to a golden brown; whilst in those with the pendulous branch-tips the bark at the base for several feet becomes rough, very corky, with deep fissures.

The *winter twigs* are bronze-coloured, smooth on the pendulous variety, slightly hairy on that with spreading branch-tips.

The *resting buds* are arranged spirally on the twigs. They are somewhat spindle-shaped, shorter, and in proportion stouter, than those of the Beech, enclosed in reddish brown scales, and pressed towards the twig. The leaf-scars are small, half-oval in shape, and show three tiny leaf-traces. The *leaves* vary, but in the main are triangular, often with an extended sharp point at the apex. The margin shows wide serrations with smaller ones intervening. Their colour is deep green, rather shiny above, paler below, slightly translucent. The change in *autumn* is to yellow,

BIRCH LEAVES.

LIGHT-LOVING BIRCHES FRINGING A PINE-WOOD.

COMMON BIRCH IN WINTER.

orange and brown. The midrib runs direct to the apex, the side ribs branch right and left, and terminate in the larger

GALLS ON BIRCH TWIGS.

serrations at the margin. The stalks of the leaves are comparatively long, about half as long as the midrib, and give a delicate poise. The leaves scarcely hide the tree's framework, and cast but a slight shadow.

The *flowers*, pollen-bearing and fruit-producing, are separate, but to be found on the same tree. They are both crowded into cylindrical catkins. The pollen-bearing catkins make their appearance in August, and remain in position all the winter through, stiffly erect in relation to the twigs which they terminate. In the spring they elongate, and fall over, hanging loosely pendulous, ready for the wind to shake out and scatter their pollen dust. All through the winter the fruit-producing catkins are safely packed away in the lateral buds of the twigs, and emerge erect with the leaves in the spring.

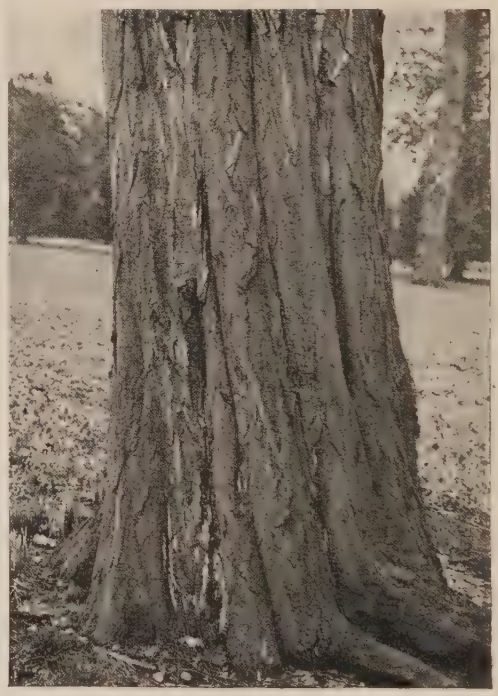
The *fruit* has the appearance still of a catkin, for the erect flower-catkin, lengthening slightly, has turned itself, pointing downwards. It now suggests a stiffish rounded tassel of threaded discs, though these discs are really elongated scales with wings so arranged that their combined edges become circular. When fully ripe, well on in the winter, these scales drop off, setting free the tiny seeds, and leaving exposed the central stalk, or thread, of the catkin, which remains long on the twig. The seeds have two round transparent wings, or sails, presenting considerable surface to the wind by which their dispersal is secured.

A rather frequent *gall* found on this tree is that caused by the Birch gall mite, a similar insect to that which affects so disastrously the Black Currant buds in our gardens. The buds infested by this mite either do not open or expand irregularly.

Another abnormal growth, and one that is peculiarly disfiguring to this tree, is that known commonly as "The Witch's Broom," a crowd of short twigs inextricably involved and massed, which grow eventually to a great size. By some this is said to be the result of the tree's efforts against the crippling action of the gall mites referred to above; but it is also explained as due to similar efforts against the mischievous ramifications of a minute fungus.

THE HORNBEAM.

The Hornbeam stands in sharp contrast with the Birch. In its younger stages, at least, it well endures if it does not show a preference for shade. It casts



TRUNK AND BARK OF THE HORNBEAM.

heavy shadows. Against the delicate grace of the Birch it appears almost ungainly. Breaking into branches generally rather low down, these rise stiff and spreading in a way that would seem to justify the description "cabbage headed." Yet the Hornbeam has a character of its own which is distinctly interesting; and, at certain seasons, a beauty which on its own lines is unsurpassed. Unfortunately the tree has endured much hard treatment in the past, for its wood proves very serviceable for the cottagers' fires. Where Hornbeams abound, as in Epping Forest, every tree has been roughly pollarded and all character lost. When allowed to live its own free life it has much in common with the Beech, which, in fact, it so resembles in many features that it has doubtless often been mistaken for that tree by the casually observant; hence its reputation for being more rare than it is.

THE HORNBEAM IN EARLY SPRING.

In *winter* its long ascending branches should be noted. In some situations and seasons its dried brown leaves still remain attached, as do those of the Beech; and, longer still than these, the ripe fruit clusters.

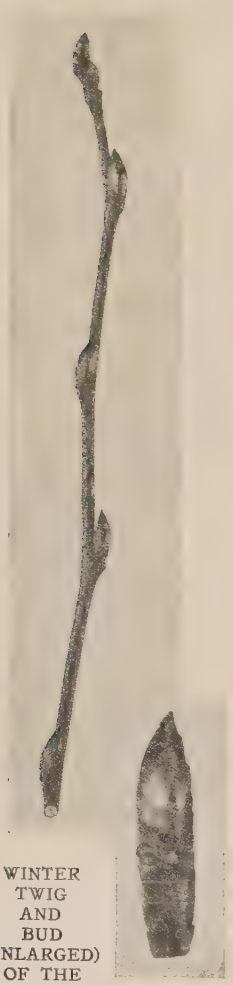
In *spring*, when its full grown multiplied catkins of pollen-bearing flowers clothe the whole tree, whilst the young leaves are yet small and inconspicuous, the Hornbeam presents, perhaps, its loveliest appearance, adorned as it were with tassels of silver and tinsel of fine gold, shimmering in the sunshine.

In *summer*, with leaves fully expanded and so spread, as with the Beech, to intercept every possible light-ray, it shows dense masses of foliage of a rich deep green, but less reflective of light than that of the Beech.

In *autumn* the first effect of the growing fruit clusters is to make the foliage appear still more dense as fruit and foliage blend together. Later, the foliage thins somewhat, but the lengthened fruit-tassels, expanding their full-grown wings, fill

up vacant spaces. Later still, when foliage and fruit change to yellow and then to russet brown, the tree has yet another beauty; and this it may hold, more or less, well on into full winter days.

The *trunk* is cylindrical, like that of the Beech, but, in distinction from that tree, is fluted as though a number of lesser stems had coalesced. But this fluting is not always very apparent until the tree has attained a good age. The *bark*, also like that of the Beech, is thin and smooth, and grey in colour. But here, again, is considerable variation, probably resulting from difference of soil and situation; it also roughens with age. The winter *twigs* are not so smooth as those of the Beech, slightly hairy, and less zigzag. The *resting buds* are placed alternately on the twig; they are somewhat flattened, and pressed up against the twig. They show numerous scales. Leaf-scars are crescent-shaped, with three small "traces" of the severed tubes. The *leaves* are oval and pointed like those of the Beech, but their dark green is without gloss, and their margins are doubly serrated throughout. They are slightly "gimped," and this gives them an apparently wavy outline. The midrib runs direct to the apex, and the side ribs (twelve to fourteen pairs of them) in parallel straight lines terminate in the larger serrations at the margin.



WINTER TWIG AND BUD (ENLARGED) OF THE HORNBEAM.

The pollen-bearing and fruit-producing *flowers* are distinct, but grow on the same tree. They are grouped into pendulous catkins and appear with the leaves. The catkins of pollen-bearing flowers grow out from lateral buds on the last season's twigs, and terminate short new shoots. The catkins of fruit-producing flowers grow out from lateral buds nearer the tip of the twig, and from the terminal bud itself. They are more loosely constructed, pale green in colour, with leaf-like pointed scales which curve backwards. The pollen is conveyed by the wind. The clustered *fruit* hangs in long tassels, something like those of the Sycamore; but here a curious leaf-like appendage, forming a kind of triple wing, to which two corn-like fruits are attached, takes the place of the double wing of the Sycamore, and answers a like purpose, aiding dispersal by the wind.

LEAVES OF THE HORNBEAM.

The following table gives the permanent and easily recognisable *distinctions between the Beech and the Hornbeam*, ignoring those which are peculiarly subject to variations in the habits of both trees.

	Beech.	Hornbeam.
To distinguish by buds.	Long, spindle-shaped; project boldly from twig.	Short, thickened, angular; pressed up to twig.
To distinguish by leaves.	When young, fringed with silky hairs; without visible serrations; polished surface; 8-10 pairs of side ribs.	No silky fringes; doubly serrated; matt surface; 12-14 pairs of side ribs.
To distinguish by flowers.	In rounded clusters.	In pendulous catkins.
To distinguish by fruit.	Two triangular nuts in a bristly capsule.	Long drooping clusters, with distended triple wings, to which two corn-like fruits are attached.

HENRY IRVING.

THE ROMANCE OF A RIVER—II

By J. LOMAS, F.G.S., A.R.C.S.

Photograph by Taunt, Oxford.

"THE THAMES ITSELF . . . . BEGINS AS A MERE TRICKLE."

SO far we have studied a small stream from its birth in the hills until it loses its identity on joining a large river. We now have to compare the large example with the small one and see in what respects they agree and how they differ. Obviously the torrent stage will be the same in both, for the mighty river is only the result of the fusion of many small contributory streams. The Thames itself, the noblest of English rivers, begins as a mere trickle rising from the Seven Springs in the Cotswolds. The following inscription has been carved on a stone near the mossy pools from which the feeders take their origin :—

HIC TUUS
O TAMESINE PATER
SEPTEMGEMINUS FONS.

In the river proper the differences we find are more of magnitude than of kind. Like the brook, it swings in rhythmic curves, but these, being dependent on the volume of water, are naturally much larger. In place of the tiny loops a few yards in diameter they are sometimes measured in miles.

In the case of the Mississippi they are from three to six miles across, and in some instances the curves are so sharply folded that in travelling down the river you may

be only half a mile away from a certain point across the neck, and yet be twenty or thirty miles distant if you go by water.

If a county map of England be examined, it will be found that rivers have been very largely used to define the limits of counties and parishes. No doubt they were chosen in times long past as providing an easy, natural, and clear line of demarcation. Perhaps, too, the idea of permanence was a factor in the minds of those who determined that rivers should serve as boundaries. If so, they were sadly mistaken. The River Mersey, for instance, runs as a thin line between Lancashire on the north and Cheshire on the south; but reference to an ordnance map will show that portions of Lancashire are on the south side of the river and parts of Cheshire are on the north. Similarly, Cheshire and Flintshire exchange plots on each side of the Dee, Derbyshire and Leicestershire along the course of the Trent, and Shropshire and Merionethshire on alternate banks of the Vyrnwy. In the sketch map on the opposite page a portion of the River Dove is given which serves to limit the counties of Stafford-

"THE MIGHTY RIVER IS ONLY THE RESULT OF THE FUSION OF MANY SMALL CONTRIBUTORY STREAMS."
The source of the Lowther.

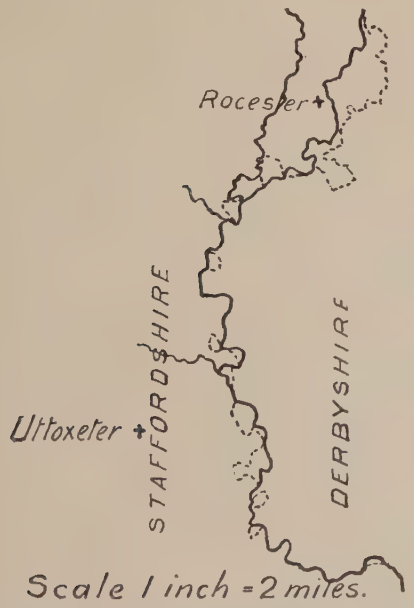
"THE RHYTHMIC CURVES ARE NATURALLY MUCH LARGER."
The Dee at Chester.

shire and Derbyshire. The river is represented by a continuous line, while the broken lines, sometimes coincident with the river and at other times forming loops on either side, show the county boundaries.

THE CURVES OF THE WYE.

These curious anomalies simply resolve themselves into a consideration of the changes which the rivers have undergone since the boundaries were established. An interesting case occurs near London. North Woolwich is in the County of Kent, and yet it is on the Essex side of the Thames. These examples, and many others which might be quoted from other parts of the country, tend to confirm what we discovered when dealing with our type stream. Rivers are not mere dead features on the face of the country, but active, changing —living.

A river in its upper reaches has usually sufficient carrying power to sweep its course clear of the *débris* loosened by itself or by frost from its banks. Hence the bed is on rock and clean from sand. But in the plains, with diminished velocity, it is incapable of carrying anything but the finest mud in suspension, and the coarser particles accumulate on its bed. Then comes flood time, when a great scouring takes place. The sand is swept further down stream, or spread over the surrounding country to form the "flood plain." Finally the sea is reached, the current is arrested, and it drops all its burden. Should it enter the sea by a wide estuary, the inrush of tidal waters twice a day sweeps the *débris* brought down by the river up and down stream with the flood and ebb. As a rule, the velocity of the ebbing tide is less than the flowing tide, and more suspended material is carried inwards than outwards. This results in a gradual accumulation of sand, and finally the estuary may be silted up. At low water sandbanks are left high and dry, and through these the current flows in uncertain and tortuous channels. But if the estuary narrows near its mouth, the rush of water through the small opening keeps an open waterway.



THE RIVER DOVE AS COUNTY BOUNDARY.
Showing how the river has changed its course.

The estuaries of the Mersey and the Dee afford very striking contrasts. They open into the same sea, they are subject to very similar tidal conditions; but while the Dee is V-shaped with the wide part of

"ITS BED IS ON ROCK AND CLEAN FROM SAND."
The Strid : Wharfedale.

the V facing the sea, the Mersey is bottle-shaped, three to four miles wide inland, and the neck of the bottle, less than a mile wide, is turned seawards. So it happens that Chester, once a flourishing port, has lost its former importance in this respect. Only vessels of small tonnage can approach its wharves, and these only at high water, whereas Liverpool has become the great gateway to the West, and the largest vessels afloat can enter its docks.

Now let us consider what would happen if the river on entering the sea were not subject to tidal influences, or if the tides were feeble as compared with the current of the river. Such conditions are found in the Mediterranean. The waste brought down by the Rhone, the Po, and the Nile does not get redistributed by tidal action, but falls to the bottom of the sea when it meets the salt water. Thus vast quantities of sand and mud are constantly tipped over the banks which form at the mouths of these rivers. These banks grow outwards like a fan, and in the end form low, swampy deltas, traversed by "distributaries," which radiate from the point at which the delta first began to accumulate. The amount of material brought down by rivers varies with the seasons. When the Nile is in flood, the water which passes through Cairo is like chocolate in colour. The Yellow River

"IN THE PLAINS IT IS INCAPABLE OF CARRYING ANYTHING BUT THE FINEST MUD IN SUSPENSION."
View on the River Sulby above Greenland Bridge.

"AT LOW WATER SANDBANKS ARE LEFT HIGH AND DRY."
The Mawddach from Panorama Walk, Barmouth.

and the Amazon bring down so much fine mud in suspension that the sea is coloured for many miles from the coasts. The Rhone is fed by melting glaciers, and owing to the presence of suspended rock flour, is milky white until it clears itself on traversing the Lake of Geneva. We cannot conceive the vast quantities of waste which the great rivers of the world are constantly depositing in the oceans. What we must keep in mind is the fact that all this comes from the land. It may be stated as a simple rule that while the land gives much to the sea, the sea gives nothing to the land.

Rivers play an important but not the principal *rôle* in excavating the solid rocks, but they are pre-eminent as agents of transport. The excavating power of a river depends on two factors — the hardness of the rocks and the quickness of fall. We have already seen that when traversing hard rocks the stream is confined to a narrow channel and cuts a gorge with almost vertical sides, and when it flows through softer material it tends to widen its valley

Thus even at a distance in looking over a valley we can tell at once the nature of the ground.

It is obvious, too, that the more rapid a stream is the greater power it will exercise in deepening its channel. If two streams have their origin at the same altitude, and one takes a short, direct route to the sea, and the other follows a longer and less direct course, the shorter, owing to its more rapid fall, will cut back its channel more quickly than the longer one. Thus we come to see that some streams are possessed of certain advantages even at their birth which enable them to

"THE STREAM IS CONFINED TO A NARROW CHANNEL AND CUTS A GORGE."
A view on the Lowther.

outstrip their less fortunate neighbours in the struggle for existence. The more ground they obtain as their own, the larger amount of rain they will obtain to swell their streams. They may not be so serviceable as their poorer brethren; their rapid and precipitous courses will not float argosies, nor do they tend to bind communities together by serving as a means of communication. They spend their energies in mad rushes; they give nothing to the thirsty lands through which they run, and finally on plunging into the great abyss of ocean they are swallowed up and forgotten.

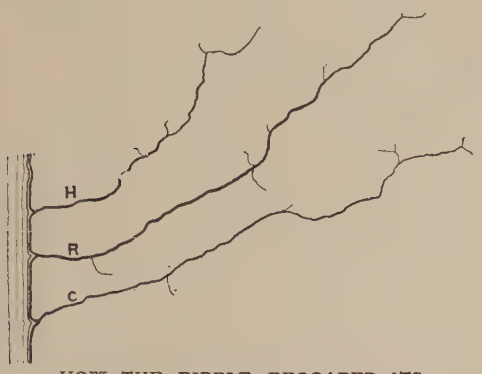
"THE TORRENT IS A SPENDTHRIFT."

Of late years attempts have been made to control some of the redundant energies of streams such as these. Power stations have been erected at the foot of Snowdon and elsewhere. The water is led through turbines, which produce electrical energy, and this is carried over hill and dale to centres of industry, and put to the service of man. But the torrent is a spendthrift. When the clouds have filled it to overflowing, it sheds its treasures without stint, with no thought of the drought which finds it with no reserve and almost helpless. To ensure stability the stream must be taken in hand at an early stage, its waters stored in a reservoir, and

"THE DROUGHT FINDS IT WITH NO RESERVE."

thus made of service all through the seasons.

Let us imagine three rivers, H, R, and C, beginning their careers on a slope of land which has just emerged from the sea. As yet the ground has not been

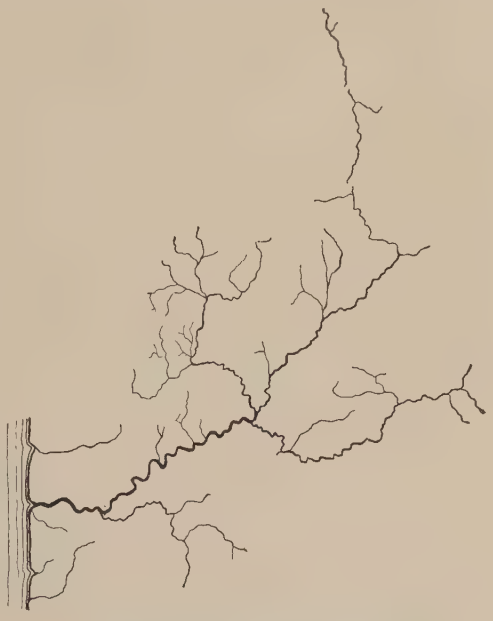


HOW THE RIBBLE BEGGARED ITS NEIGHBOURS—I.

scored by frost or rains, but presents a smooth, even surface. Gradually the forces gnawing at the rocks discover lines of weakness, and the waters begin to run in defined courses (Fig. I). Tributaries are formed which flow into the main streams, and still the three young rivers,

HOW THE RIBBLE BEGGARED ITS NEIGHBOURS—II.

pursuing independent paths, enter the sea by different mouths (Fig. II.). Now let us suppose that one of the rivers—R, for example—possesses some advantage over H and C. It cuts a deeper channel. This gives the tributaries a steeper fall, and they cut back more effectively than those of H and C. Finally, one of the tributaries of R succeeds in reaching the main stream of H, whose head waters are captured and diverted along the tributary to join R. Similarly a tributary on the left bank captures the head waters of C, and the valleys cut out by H and C below the point of capture are left streamless, or only a mere trickle is formed by



THE RIBBLE AS IT IS TO-DAY—III.

the scanty drainage from the slopes on either side (Fig. III.). The last diagram is copied from a map of North Lancashire, and gives the present courses of three rivers—the Hodder, the Ribble, and the Lancashire Calder.* Standing at the elbow of capture of the Hodder, and looking seawards, we have a broad valley in front of us through which a tiny stream flows. It does not fit the valley, but meanders in tiny curves inside a valley with swings which correspond to a much larger river. Similarly from the elbow of capture of the Calder we have an open valley towards the sea practically streamless.

* The coast-line given in the diagram does not follow the present outline of the shore. Changes have taken place since the events described above happened.

There can be no doubt that the events here shadowed have actually happened, and the Ribble has taken advantage of its superior powers to beggar its neighbours. Examples of this kind of river piracy might be quoted in great numbers from among our English rivers. One or two must suffice. We have reason to believe that at one time the Yorkshire rivers having their origin in the Pennines—the Swale, Ure, Nidd, Wharfe, Aire, Calder, and Don—emptied themselves into the North Sea by separate mouths. Along the Vale of York, where the rocks are softer than those of the Pennines or East Yorkshire, the Don sent up a tributary and successively captured the rivers to form what is now the Ouse. Again, the Thames once had its origin in the high lands of Wales, and the Severn has beheaded it. That is why the small brooks which join to make the infant Thames flow through valleys with swings altogether out of proportion to the existing conditions.

THE VICTORIA FALLS ON THE ZAMBESI.

From this we see that the present courses of our English rivers have not been determined by chance, but are the results of the working of certain well-known laws. They have been evolved by processes of natural selection. The best favoured and strongest have survived, while the weaker ones have perished in the struggle for existence.* It is evident that as rivers are constantly bringing material from the high grounds to the sea, the mountains are in process of being destroyed. We can imagine that by long-continued action they may be levelled down to form a plain but little raised above the level of the sea. Over these plains streams would flow in a feeble condition, as though in the last stages of decay. Now let us suppose that the plain were raised by earth movements to form a plateau, or, what comes to the same thing, so far as we are concerned, that the sea level were to fall and leave the plain elevated above the new sea level. This would give the rivers a new lease of life. At first they would tumble over the sea cliff as cascades, and then, gradually working back through the plateau, a new period of levelling would be commenced.

That is the story of the Zambesi and the wonderful Falls discovered by Livingstone in Central Africa. The Upper Zambesi flows sluggishly through a great plain only a little below the surrounding country. Then it falls over a great cascade 400 feet deep into a gorge which continues for many miles towards the coast. Similar features are to be seen in other rivers in Africa, and even in

* We must, of course, not overlook the fact that the control of streams has been affected by other geological considerations, more particularly by events which happened during the Glacial period. At that time a large portion of the British Isles was covered with a mantle of ice. The normal drainage was disturbed and in some cases permanently changed.

our own country. The return of youthful conditions makes them once more active agents of destruction, and, given time enough, the land will again be reduced to a low, featureless plain.

In these papers I have frequently spoken of rivers in terms usually applied to living things. No other terms but birth, youth, maturity, old age, decay, and death seem to apply when dealing with the life-history of a stream. But the words we have applied to an individual stream seem to have a wider meaning. Biologists say that the life-history of an individual outlines the history of a people; so, in rivers, the beginnings reproduce the characteristics of a stream beginning life on the first emergence of the land from the sea; the middle portion of a river reminds one of the conditions we see in streams well established; and the sluggish current of a river on nearing its end is seen again in an old river which has done its work in degrading the land and shows all the signs of extreme old age.

J. Lomas.

HOW TO KNOW THE WILD FLOWERS

By the REV. H. PUREFOY FITZGERALD, F.L.S.

With Photographs by HENRY IRVING

THE FLOWERS OF THE WATER-SIDE—I

A RAMBLE which leads through moist meadows, along the sides of a stream or by the shores of a pond or lake, will be sure to introduce us to a number of plants which will not be met with elsewhere. The very nature of the soil in which they grow helps to give a wealth of bloom, and a goodly display of foliage, and tends to make these water-side wild gardens haunts of great joy and pleasure to the lover of flowers.

MARSH MARIGOLD

Looking like a giant Buttercup, the Marsh Marigold (*Caltha palustris*) is to be found in bloom in moist spots from March to June. Though belonging to the same family, it differs from the Buttercups in possessing no petals; the large, golden cups are really composed of five coloured sepals. The stems are somewhat stout, and the leaves are heart-shaped at the base, of a very deep, glossy green, and more or less round, increasing in size after the flowering season is over. In the centre of the golden cup, surrounded by many bright yellow stamens, is a head of carpels, which develop after fertilisation, each one bearing several seeds. The name *Caltha* is derived from the Greek *Kalathos*, signifying a cup. There are many local names for this plant; among them may be mentioned King-cup, Drunkards, Marybud, Meadow Bouts (from the French *bouton d'or*), May Blob.

WATER RANUNCULUS

The surface of ponds in the spring is often to be seen covered with the blossoms of the little Water Crowfoot, which in shape and form will be noticed to be the same as the Buttercup flower, but with white petals instead of yellow. On examination, the leaves of several plants will be observed to differ considerably; the floating leaves are, for the most part, round or kidney-shaped, while those on the submerged portions of the plant are cut into very fine, hair-like segments. In one plant (*Ranunculus hederaceus*) these cut leaves are not to be found, for it grows only in shallow water and on mud banks; but there are so many varieties of the kind that bear both forms of leaves that they may, for the beginner, be classed under one heading, *Ranunculus*

THE MARSH MARIGOLD.

aquatilis. None of the Water Crowfoots possesses the acrid taste of the Buttercups, therefore we presume that this property has been developed by the latter to protect them from being eaten by cows and other animals.

YELLOW IRIS

The Yellow Flag or Iris (*Iris pseud-*

WATER CROWFOOT.

PLANT LIFE

THE FLOWER

Specimens required :—Flowers of Wallflower, Herb Robert, Buttercup, etc.

Structure

Examine a blossom of the Wallflower. Note the following points :—

(*a*) Sepals (number, colour, united or free), forming calyx.
(*b*) Petals (number, shape, colour, united or free), forming corolla.
(*c*) Stamens (number, shape, position), pollen.
(*d*) Pistil with ovary at base.

Also observe :—

(1) The function of the calyx.
(2) Cross arrangement of petals.
(3) Structure of stamens, filament, and anthers.

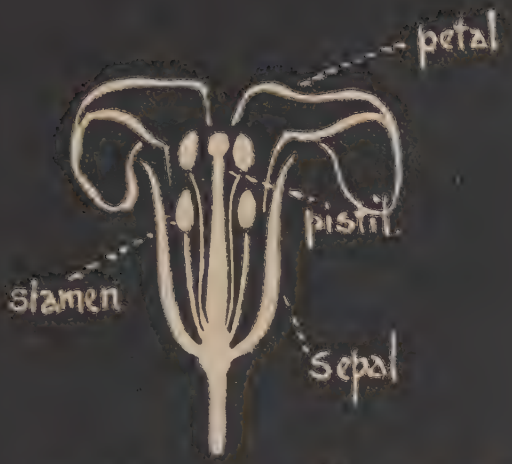
Make section through flower, distinguishing the parts named. Proceed similarly with other flowers, drawing sections for record.

Floral Diagrams

The flower consists of four series of floral organs—*viz.* calyx, corolla, stamens, pistil. Thus the flower may be represented in diagram by four series of lines—*viz.* a central mark to represent pistil, a circle of marks to indicate stamens, another circle of lines to show petals, and an outer circle to represent the sepals. Such a diagram represents the floral organs in number and position.

Note.—The Wallflower as a type of the Cruciferae introduces the study of many common members of that family.

PLANT LIFE. THE FLOWER



Sectional diagram.

Floral diagram

4 sepals

4 petals

6 stamens

pistil

Dissection

Plan

WALLFLOWER

CRUCIFERAE

acorus) is one of the most striking of all our wild flowers; its group of long, sword-like, pale green leaves, and its head of bright yellow flowers, will always catch the eye of the passer-by. The rootstock is thick, and grows in a horizontal position, throwing off the stems and leaves; it is very astringent and acid to the taste.

YELLOW IRIS.

Two or three bright yellow flowers appear on the flowering stem from a large sheathing leaf or bract, and if one of these be pulled carefully to pieces, it will be found to consist of nine portions. Since both the sepals and petals are coloured, the whole of the coloured flower is called a perianth; the three large, spreading portions (which give the name Flag) alternate with three smaller, upright inner segments. Over the larger segments there are three petal-like stigmas (the female parts), which serve as a covering to the stamens.

The Yellow Iris flowers towards the end of May and continues to do so throughout June.

Iris is the Greek for a rainbow, and the name was given to this group of plants on account of the many colours which are to be found among members of the genus; the name *pseudacorus* means "resembling the Sweet Sedge." The local name "Segg" is a corruption of sedge, and comes from the Anglo-Saxon word *segg*, meaning a small sword, from the shape and sharpness of the leaves. This plant is the original of the *fleur-de-lys* in the arms of France.

The Stinking Iris (*I. fœtidissima*), which is found in the hedges, is a smaller plant, and bears violet blue flowers; on being bruised it emits a somewhat disagreeable smell, though it is said by some to resemble the odour of roast beef.

is so handsome as *M. palustris*. One of the legends concerning the name is as follows: A knight and his lady-love were strolling along the banks of a stream, where the plant was bright with its turquoise blue flowers. When the lady

FORGET-ME-NOT.

FORGET-ME-NOT

The Forget-me-not (*Myosotis palustris*) will not call for much introduction, for its garden descendants are well known, and it is a general favourite. The common form is found growing in moist meadows and ditches and other like localities, and flowers abundantly during the whole summer.

The stems are rather weak, usually from twelve to eighteen inches high, bearing a long raceme of flowers of a clear, bright blue colour, with yellow eyes. The leaves are to be found with or without hairs, the latter form giving the name, Myosotis, from two Greek words meaning Mouse's ear. All the petals are joined together, forming the corolla, which varies very much in size according to the situation and the variety. Several kinds of Forget-me-not are to be found growing away from the water, but none of these

expressed her wish for some, the knight rushed into the stream and plucked them, but was carried away by the eddy after casting the blossoms at her feet, exclaiming "Forget me not."

MEADOW SWEET

The tall stems of the Meadow Sweet (*Spiræa Ulmaria*), crowned by the creamy, foam-like heads of flowers, are striking objects growing in damp meadows and on the banks of ponds and ditches. This plant belongs to the Rose family; the stem is usually of a reddish colour, about three feet high; the leaves are pinnate, the terminal leaflet being divided into three others, all of them green above and somewhat whitish and soft with down underneath. The small flowers are very numerous and strongly scented, the odour resembling that of almonds. This scent acts in the place of

MEADOW SWEET.

COMMON SKULLCAP.

honey (of which there is none) in attracting insects. The flowering season extends from June to August.

COMMON SKULLCAP

Another member of the *Labiatæ* to be found growing in moist spots is the Skullcap (*Scutellaria galericulata*), but it is difficult to say what is the origin of the common name, for there is no resemblance to a skull. The branching stems spring up from a creeping root-stock, growing nearly a foot in height; the leaves have scarcely any stalks at all; they are arranged in alternate pairs up the stem, and from the axil of each leaf a flower is produced; these flowers all turn to one side and are of a bluish colour. The lips of the corolla are very nearly closed. This seems to be for the purpose of admitting insects of a certain size only, for there is an arrangement inside by means of which the pollen, which has fallen out of the anthers, will be displaced and showered down on the back of the small insect as it pushes its way through in search of nectar, and which is carried by it to another flower.

WATER PLANTAIN.

The Lesser Skullcap (*Scutellaria minor*) is a much smaller plant, bearing small pink flowers; it is much less common in England. Both these plants flower throughout the summer.

WATER PLANTAIN

The photograph of the Water Plantain (*Alisma Plantago aquatica*) shows the appearance of the plant in the early seeding stage after it has flowered. The large leaves, all springing from the root, and

the tall, loosely panicled flower stem will readily serve for identification. The flowers themselves, borne throughout the summer, are somewhat small, of a pale rose colour; the perianth has three small outer portions and three larger inner ones, resembling petals; the six stamens each have two honey glands, one on each side of the base.

H. PUREFOY FITZGERALD.

HOW TO KNOW THE WILD ANIMALS

By DOUGLAS ENGLISH, B.A., F.R.P.S.
Author of "Wee Tim'rous Beasties," etc.

THE SHORT-TAILED MEADOW MOUSE.—I

SHORT-TAILED FIELD MOUSE. FIELD VOLE. COMMON VOLE.

With Photographs by the Author

I HAVE come across a delightful Suffolk name for this beastie, one of those impetuous mother-tongue names which it seems almost sacrilege to print. Suffolk is rich in such. "Ranny-nose," the Shrew Mouse, for instance (they speak, too, of a "ranny-nosed" plough), "Fuzz-tail," the Stoat, "Mouse-hunt," the Weasel, "Pick-cheese," the Tit Mouse, "Tittereen," the Gold-crest, "Hodmadod," the Snail—fair samples all of a speech which is dying of education, but which yet has sufficient strength to speak simply of "Mouse Bats" and "Rat Bats," and to call the Meadow Mouse a "Mogger."

"Mogger" is more subtle than the others; yet no one who knows the animal can miss its meaning, while for those who do not know the animal the sound of it should almost suffice.

In the Short-tailed Meadow Mouse — markedly in the allied form which is peculiar to the Orkney Islands — we find the pure Meadow Mouse type. We leave behind the bold, round, staring eyes, the outshot ears, the fined extremities, which have characterised the species already dealt with; and find, in place of these, their opposites, small, beady eyes, ears hidden in the fur, stub tails, and blunted noses. The Meadow Mouse is the true Mouse compressed: he is Dutch-built. Nor has Nature contented herself with compressing his form: she has compressed his character. The Meadow Mouse has the lymphatic temperament; he is incurious; he lacks ambition; he potters round his birthplace. He may creep the length of the hedge-row timidly, but he will seldom work through it, nor can he scale it. His world is bounded by familiar grass stems, and with these he rests content until there comes a time when, all things combining to favour his increase—mild winters, excess of food, excess of cover, and a tem-

"MOGGER."

porary disturbance of Nature's balance —he multiplies, with amazing swiftness, into a plague.

THE SHORT-TAILED MEADOW MOUSE FEEDING.

Plagues of Meadow Mice (or some closely allied species) date almost from the dawn of history.

We read in the Septuagint version of 1 Samuel v.–vi.: "And the hand of the Lord was heavy upon Ashdod, and brought (evil) upon them, and boiled over upon them in their ships, and mice sprang up in the midst of the land . . . . and the ark was in the field of the strangers seven months, and their land boiled over with mice."

Herodotus recounts how Sethon, a priest-king of Egypt, was successful in checking the invasion of Sennacherib, King of Assyria, about 700 B.C. Sethon had imprudently snubbed the military caste, with the result that, on the appearance of Sennacherib, he found himself without an army. This sent him in great distress to the temple of Hephaestus, and there he had a vision of the god, who cheered him with a promise that he would find him allies. Relying on this promise he led out a mixed force of "shopkeepers, artisans, and loafers" to battle with Sennacherib.

The Greek text proceeds: "And when they reached that place (Pelusium), Field Mice were poured upon their enemies in the night, and they gnawed into their quivers and into their bows, moreover they gnawed into the hand-straps of their shields, so that when they fled on the morrow many perished for want of weapons. And now this king stands in stone in the temple of Hephaestus, holding a mouse in his hand, and saying, as the inscription shows, 'Whoso looks on me, let him be blessed.'"

The Greeks would seem to have favoured another deity. "Sminthos" is a word used by Æschylus for "mouse," and it is possible that Apollo Smintheus, mentioned in the Iliad, may mean Apollo the Mouse-killer, or Lord of the Mice.

We find distinct references to an early mouse-plague in Italy, both in Ælian and in Diodorus. Ælian's version is: "The incursion of a horde of Field Mice (by the gods no light matter!) drove certain of the people of Italy from their native place, and made exiles of them by ruining their crops and pasturage, just as drought or frost or other inclemency of weather would do—part the mice shaved close to the ground, and part they cut through the roots of."

It is noticeable that in all these cases the Greek clearly implies that the appearance of the mice was sudden as well as overwhelming. This suddenness seems to have been characteristic of mouse-

THE MEADOW MOUSE'S TUBE.

The opening has been cleared and the grass on the near side cut down to show the arch of the tube above ground level.

CHARACTERISTIC ATTITUDES
OF THE SHORT-TAILED MEADOW MOUSE.
The lower picture shows a combat.

plagues from Biblical times to the present day.

Holinshed, writing of our own country in Queen Elizabeth's reign, says: "About Hallowtide last past (1581), in the marshes of Danesey Hundred, in a place called South Minster, in the county of Essex . . . . . there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes, did sheare and gnaw the grass by the roots, spoyling and tainting the same with their venimous teeth in such sort that the cattell, which grazed thereon, were smitten with a murraine, and died thereof, which vermine by policie of man could not be destroyed, till at the last it came to pass that there flocked together such a number of owles, as all the shire was able to yield, whereby the marsh-holders were shortly delivered from the vexation of the said mice. The like of this was also in Kent."

The report of the Departmental Committee appointed by the Board of Agriculture in 1892, to inquire into a plague of Field Voles in Scotland, from which the above quotation is immediately derived, forms a very interesting and a very cheap book of natural history.* The area damaged in this particular instance during the years 1888–1891 amounted to not less than sixty miles in length and from twelve to twenty miles in breadth. As is usually the case in matters connected with land, the Committee was confronted with the rival claims of two distinctly opposed interests. On the one hand, in the interest of the farmers, witness after witness testified that the plague was solely to be accounted for by the game-keepers' wanton destruction of winged and ground vermin. On the other hand, in the interest of the game preservers, there was good evidence to show that the destruction of vermin had not been excessive, and that the plague was solely to be accounted for by a succession of mild winters and an abnormal growth of food and cover for the mice.

The finding of the Committee that the plague was due to a combination of all these causes, and that a prompt organisation of the farmers to stamp it out in its early stages would probably have greatly mitigated its severity, will hardly be disputed by anyone who reads the evidence impartially.

In the course of the inquiry some interesting information with regard to what may be called the climatic cause of the outbreak was obtained. There was indisputable evidence to show that the seasonal conditions which favour a mouse plague are—a wet autumn, a mild winter, and a dry spring, in immediate succession.

A wet autumn results in a luxuriant growth of rough grass, which serves as cover for the mice, and at the same time provides them with unlimited food. By a "mild" winter is meant the absence of black frost of sufficient severity to search their winter burrows. Neither snow nor rain, apart from actual flooding, has any terror for them. Both in this country and in higher latitudes they move freely in tunnels underneath the snow, counting the snow as so much additional cover, while a soft, damp soil in general attracts them. In fact, they normally inhabit marsh-land by reason of its "roughness." A dry spring implies comfortable conditions for breeding, and that dryness of the nest which is essential to all young animals. Of these three favourable seasonal conditions I think that the first is perhaps the most important.

I have already referred to the timid, spiritless character of the Short-tailed Meadow Mouse, and my estimate of him is based, partly on my experience of a large number of captive specimens, and partly on certain observations which I was able to make on a small wild community. These observations commenced early in April, 1906, and extended over several weeks. The burrow was situated in the midst of a water-meadow, and the occupants had taken advantage of the roots of an old ash stump to save themselves unnecessary exertion. My first intimation that the stump—which scarcely rose above ground level—held tenants, was a momentary flash of brown. The distance was too great for me to determine its origin, but on the next occasion I approached more carefully and satisfied myself that I had a mouse to deal with. Then followed several stealthy ap-

* Obtainable through Wyman and Sons, Ltd., Fetter Lane, E.C. Price, 1s. 4d.

proaches daily, and, with the aid of a field-glass, I managed to see something of the daily round. The grass which surrounded the burrow was at the commencement of my observations quite short, and although I satisfied myself of the existence of two entrance shafts, each with a clear perpendicular drop of about nine inches, I could find no trace of anything in the nature of a run leading up to them, nor did I ever see the mice move more than a couple of inches away from them. They would often sit at about this distance to sun themselves, and, at intervals, performed their toilet, but, at the slightest sound or movement on my part, even though I was a dozen yards away from them, they would whisk about and vanish. I discovered later that they turned, flung themselves at the shaft, and dropped down it almost in one motion, and I have no doubt that this first clean drop often saves them from their enemies. A weasel, for example, though he could dive as quickly as the mouse, would waste a moment at the bottom in turning and getting his hind legs clear. So long as the grass remained short the mice never ventured to feed outside (no doubt they had a store in the burrow), but once it began to grow they commenced their characteristic surface runs, and presumably fed along them. These runs, when freshly made, are difficult to follow. They can best be traced by lowering and bending the head so as to catch the shadow of the displaced grass at a suitable angle. The run itself is usually on and not below the surface, and is completely screened by the lower portions of the grass-stems. By inserting a finger gently within it one is quickly convinced of its protective character, for one's finger becomes invisible.

DOUGLAS ENGLISH.

OLD ENGLISH GARDENS

By H. H. THOMAS

SOME gardens are like certain gardeners: they seem to be born, not made. And the old English garden is one of them. It would not be an easy matter to say how an old English garden should be made, for its most treasured attribute, its chief characteristic, is an indefinable charm—a charm so elusive that it is difficult to account for, and altogether beyond the power of the garden-maker to create. It has been said that in the making of a garden Time plays an all-important part, and in an old English garden Time plays the most important part of all: "touching crude colours to restful tones, glaring effects to subtle harmonies." There is an old-world atmosphere about the old English garden, an enchantment born of the happiest association of leaves and flowers, and these are beyond the power of man to furnish except in harmonious working with the softening, mellowing touch of Time that clothes even the commonest flowers with a halo of charm. It is strange yet it is true that one may spend days and hours in the most magnificent of gardens, planted with the costliest flowers which make brilliant colour masses that are the despair of the artist faithfully to portray, yet no appeal is made to that susceptibility to the presence of the beautiful in Nature which exists in all of us: the galaxy of colouring is wanting in subtle association, a sense of artificiality is all-pervading. One realises that the garden lacks that distinctive, that indescribable charm born only of clustering blossoms which have lived and loved together for many years. It is as though one compared the home life of the happy, thrifty cottager, the fond ties that exist between father, mother, sister and brother, linking one to another in a firm, close-cleaving affection, har-

monious and perfectly balanced, with the stilted form, the false atmosphere, the apparent goodwill and friendliness of the greetings of half-strangers in a society drawing-room, where an air of hypocrisy ruffles the surface calm, and unreality reigns supreme. There is as great a difference between the modern

Photograph by F. Mason Good, Winchfield

A WISTARIA-COVERED PORCH.

garden, where plants, raised in an artificial temperature, crowd each other in the beds and borders, and the old English garden where the plants have grown together from babyhood and thrive in perfect harmony, each content to play its own part in the making of a garden-home without encroaching on the rights of others.

An old English garden is most easily made with those commonly known as hardy border flowers, with Phloxes, Irises, Roses, Carnations, Pinks, and Picotees, with Pæonies and Pyrethrums, Lupines and Larkspurs, Lilies, Hollyhocks and Bell-flowers, for these thrive best when carefully planted and allowed to go their own way, undisturbed and unrestricted. Each soon finds its own level: although during the first few years some may need gently reproving and others tenderly nurturing, gradually they will come to blend into one harmonious whole, each filling its own allotted space and not interfering with its neighbour. Not everyone can hope to make an old English garden, a garden that shall be as part of one's life, a fount of joy in times of bright sun-shining, of soothing sympathy when days are dark. It is only those of us who are content to leave well alone, to let the plants go *their* way and not compel them to go ours, that are capable of guiding a garden to its fullest destiny and investing it with a charm that shall finally pervade it from end to end, and make of it a thing most beautiful. More gardens are spoilt through being continually disturbed than in any other way: possibly this is the reason one sees so few of those gardens which have come to be known as old English gardens, a title that signifies not merely a collection of plants, but a home of flowers in which sacred memories cluster about the leaves and petals, and the very air seems filled with a sense of rare delight.

The house itself has an important bearing on the garden, and especially on the old English garden: there are some houses around which it would seem impossible to make a garden of grace and charm—houses whose austere fronts and formal terrace walks are quite out of keeping with free-growing, old-fashioned flowers. Yet much may be done to bring the house into closer touch with the garden. Climbing roses, Honeysuckle, Ivy, Clematis, and other plants that love to cluster about barren, sun-kissed walls, must be trained to cover the brick and stone with fair leaves and fragrant blossoms, looking in at the window, clinging round the door.

Photograph by F. Mason Good, Winchfield.

COTTAGE AT STUDLAND, DORSET.

Photograph by F. Mason Good, Winchfield.

THE GARDEN, HOME PLACE, LIMPSFIELD.

There should be shrubbery borders at the foot of the house walls planted with sweet-scented Verbena, with bush Honeysuckle and Mock Orange, with Myrtle, Lavender, and China Roses. Then the house would seem to have a greater affection for the garden and be less likely to rob it of its charm.

window with as little compunction as it creeps up the house wall. One cannot help feeling a strong affection for such a plant as this: if only well and carefully planted it seems as though it could never do enough to reward you, and considers all obstacles as something to be covered with a delicate tracery of elegant leafage.

Photograph by F. Mason Good, Winchfield.

"A LEAF-ENCLUSTERED COTTAGE."

The effect of the house on the attractiveness of the garden is seldom realised. Who, after a glance at the creeper-covered, leaf-enclustered cottage shown in the illustration on this page, can doubt the influence of the house to make or mar the beauty of a garden? This is an ideal cottage around which to make an old-fashioned English garden. The garden should come near to the doors of the house, then the narrow borders and flower-fringed doorway would bridge the little gap, making the whole domain a delightful home of flowers. Even the roof itself should know the clinging Virginian Creeper that recognises no conventions, and climbs the chimney, covers the roof, and clings to the bedroom

Even a cold north wall, where few flowering plants will thrive, has no terrors for this ubiquitous creeper, which clings as firmly to the shadowed bricks as to those well warmed by the sun.

But the Rose remains King of climbing plants: there is none to rival its profusion of blossom, its fragrance, homeliness and charm, and in the making of an old-world garden, climbing roses must cover the house walls with a galaxy of fairest blossom. The King of climbing plants is just a little fastidious, and droops and pines under neglect, but who, knowing the fascinating beauty that lies hidden within the prosaic green shoots, would be guilty of such bad gardening as to ignore the needs of the consort of the

Photograph by F. Mason Good, Winchfield.

"A GARDEN OF MEMORIES."

Queen of flowers? Even the most delightful among old English gardens owes a great deal to attention to small details, and of these the careful preparation of the soil is the chief, and to roses climbing the house the most urgent.

Even when well and carefully planted one thing still remains to be done if the climbing rose is to give of its best, and

Photograph by F. Mason Good, Winchfield.

GARDEN OF SHIPLAKE COURT.

that the most ruthless work of all. The shoots, even if 6 feet long or more, should be cut down to within 3 or 4 inches of the soil: then, and then only, is it possible to promote the growth of shoots that shall transform the bare walls into canopies of flower and foliage. And much the same treatment is needed by other climbing plants when first put out at the foot of the house or garden wall.

Wide borders of simple shape suit the old English garden best, borders in which the plants have plenty of room to grow and make wide masses of rich colour. Old-fashioned flowers, such as Lilies and Phloxes, Irises and Larkspurs, are best in groups: to rob them of each other's company is to spoil the appearance of the garden and to divest it of its chief delight. The pathways should be fringed with white Pinks and crimson Thrift, in front of the giant spires of Larkspur following closely on Lupines in rose and white and blue: Oriental Poppies, multi-coloured Pyrethrums, Flag Irises, Gloire de Dijon and William Allen Richardson Roses, Cornflowers, Foxgloves, Violas and Pansies, should find a place among the early summer flowers; while Madonna Lilies bordering the grassy way beneath the pillared pergola would make, perhaps, the fairest sight of all, since they bloom with the roses.

But the old English garden is not made entirely with plants that are left alone from year to year: some old-world favourites are raised from seed and take the place of the spring blooms, carpeting with fair blossom ground that would otherwise remain bare. Such, for instance, as Candytuft, Sweet Alyssum,

Musk and Mignonette, Shirley and Iceland Poppies, Love-in-a-mist and Nigella, Musk Mallow and Venus' Looking-glass. All are delightfully easy flowers to grow, and so, above all others, are best suited to the old English garden, whence rebellious plants are barred. One simply sows the seed in spring, and removes the seedlings here and there when they cluster too thickly, and again the garden goes on its own wild way.

Photograph by F. Mason Good Winchfield.

IN THE FLOWER GARDEN, BELVOIR CASTLE.

Above all things, however, the old-fashioned garden should have a border full of fragrant leaves and sweet-scented blossom, of Bee Balm, Southernwood, Lads' Love, Lavender, Rosemary, Thyme, and Sweet Verbena, for such as these are the very soul of an old-world garden—these together with Cabbage Roses, the quaintly striped blooms of the York and Lancaster Rose, the pink and crimson Monthlies, the Cluster Roses, white Pinks and London Pride. Then the dark red and crimson roses must not be forgotten, for more often than not these have a full fragrance that is wanting in the paler sorts. Such, for instance, as General Jacqueminot, Sultan of Zanzibar, Duke of Edinborough, Duke of Wellington, A. K. Williams, and Fisher Holmes are indispensable in a garden that is destined to take its place among those honoured by the name of old English. They are as the breath of the garden, the spirit of its being, for enchantment rides on fragrant wings, sweet scents hide subtle charm. Thus if one would make an old English garden he should first take care that the prosaic foundation, without which the most exquisite superstructure cannot last, is not wanting. It should be firm and well laid, for the glory of the garden grows slowly, yet on a good foundation most surely as the years pass by. Then are chosen the most fragrant blossoms that sweet thoughts may come to one on the breath of the flowers, wafted like echoes from a fast fading, hallowed past. Some of these should be near the house windows that, morning and evening, noon

and night, there might come a message from the flowers bringing inspiration at working time, and even a glamour to your dreams.

The real old English garden is modelled closely on Nature's own wild garden of the fields and woods. Having chosen the most suitable spot for the various plants, one leaves them to the soft summer breeze, the cool night air, strength-giving sun and refreshing rain, that they may live their lives without further interference, conscious that in due time they will give of their best. Only when Time has made perfect the imperfections of man's work among the flowers can the old English garden be said to have reached its fullest beauty; then it is surpassed by none in grace and charm. There is something about it that speaks straight to the heart, casting an irresistible spell and bringing home to one the delights of a garden tended by Nature herself. A garden grown old is the most beautiful of all, and it is only by leaving the plants to the subtle skill of Nature and the fostering care of Time that a garden can grow to a perfect old age. Flowers continually disturbed lose their hold in the garden scheme; they strike a false note and mar the harmony of the whole. A sense of peace hovers over the garden that is old: the plants are treasured friends with which one has grown up: they are linked inseparably with the joys and sorrows which have beset the pathway of life. An indissoluble bond of fellowship binds them to us: with us they were young, with us they are growing old.

H. H. Thomas.

Photograph by Pictorial Agency.

IN MISS H. PERRIN'S GARDEN AT TERENURE.